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NATO LONG-RANGE THEATER NUCLEAR FORCE MODERNIZATION: RATIONALE AND UTILITY [redacted]

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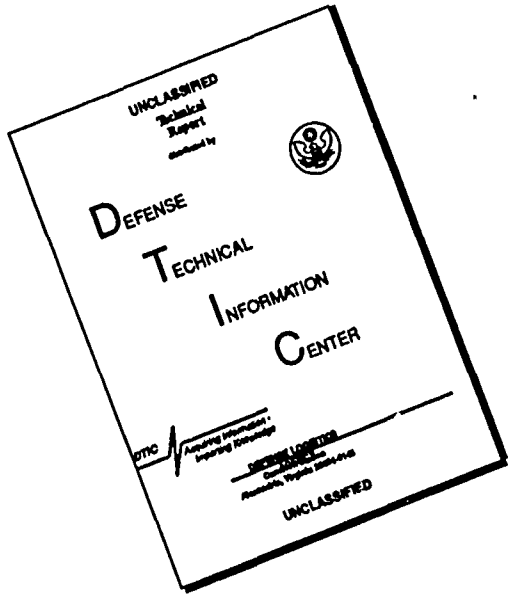
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[redacted] This report deals with the background and rationale for long-range theater nuclear force (TNF) modernization, the roles and utility of long-range TNFs in NATO strategy, and what NATO can and cannot expect from long-range TNF modernization. It includes supporting analyses of the characteristics, costs, and capabilities of alternative cruise and ballistic missile systems; the worldwide and regional balances of NATO and Warsaw Pact nuclear forces; NATO's long-range TNFs and intercontinental nuclear forces that could survive

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and be available in a war in Europe; potential arms control constraints on long-range TNF modernization; and British nuclear forces and their relevance to NATO's plans for long-range TNF modernization. (Author)

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SUMMARY

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NATO is currently considering the modernization of its long-range theater nuclear force (TNF), i.e., those nuclear forces based in Europe that can reach the Soviet homeland. This activity began in early 1977 when the Defense Planning Committee selected ten long-term priority program areas, one of which dealt with TNF modernization, and established task forces to draft a long-term program in each. The tenth task force on TNF modernization is still at work.

This study examines the rationale and utility of long-range TNF modernization. The focus is on the critical strategic and political issues that will bear heavily on future deployment decisions.

RATIONALE

The rationale for long-range TNF modernization comes from a set of problems that has faced NATO for many years. First, in the evolving Soviet nuclear threat to NATO in Europe, a small fraction of the projected future SS-20 force can destroy most of the military installations and personnel that support NATO's nuclear and conventional forces in Europe. The rest of the SS-20s can be dispersed so they cannot be located and destroyed in a NATO second strike. Thus, the threat of a general nuclear response and escalation to general nuclear war may not be a credible deterrent of such theater nuclear attacks, especially if collateral civilian damage is relatively low. Second, in view of the vulnerability of NATO's nuclear-capable aircraft, only submarine-launched ballistic missiles (SLBMs) at sea would survive a Soviet nuclear attack on Europe and there are doubts as to their availability for limited responses. French SLBMs are not committed to NATO and British SLBMs will probably be withheld for supreme national interests. More significant, however, is the European concern that the United States would be deterred from using the NATO-committed weapons on its Poseidon SLBMs if the United States had not been attacked first. Third, credibility of the whole U.S. nuclear guarantee to NATO is in

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doubt in an era of strategic parity between the United States and the Soviet Union. Some even question the existence of strategic parity because SALT II gives the Soviets important advantages in future counterforce capabilities, i.e., in intercontinental ballistic missile (ICBM) throw weight, that could lead to a serious threat to the U.S. ICBM force. And fourth, with perceptions that U.S. and Soviet strategic forces are neutralized by SALT, the growing imbalance in long-range, land-based TNFs between NATO and the Soviet Union has raised European concerns about the whole future of a U.S.-led security structure in Europe. The Germans are especially concerned about this and their possible political-military isolation and vulnerability.

These problems suggest the need for a new long-range TNF that is (1) effective against a wide range of military targets in the non-Soviet Warsaw Pact countries and the Western USSR, (2) able to survive nuclear and conventional attacks, though not necessarily in the surprise, "out-of-the-blue" worst case, (3) independent of U.S., British, and French strategic forces, (4) a visible "counter" to the SS-20--it will not provide a military counter because the capability to locate dispersed and hidden SS-20s in wartime is unlikely to exist, (5) land based, and (6) deployed or operated in at least one other non-nuclear state than Germany. It appears that either a ground-mobile ballistic or cruise missile system would have these desired characteristics.

UTILITY IN NATO STRAGEGY

For deterrence of theater conventional war, NATO relies on its conventional forces for sustaining a forward defense and inflicting serious losses on the aggressor. Although NATO retains the option to initiate the use of nuclear weapons, TNFs are not viewed as a substitute for conventional forces. NATO's aim is to present the Soviets with the enormous risk that a conventional war might escalate to the theater nuclear and possibly the intercontinental nuclear level. In this strategy, long-range TNFs can provide nuclear options, including preemptive attacks against the Warsaw Pact, to form a continuum of

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deterrence. By increasing the risk of escalation, these weapons provide a link to U.S. strategic forces and thus enhance "coupling." However, if a severe crisis or a large-scale conventional attack should occur, NATO would probably find itself deterred from using its long-range TNFs against targets in the USSR because the risk of a Soviet nuclear response would be unacceptable. This suggests that escalation control or dominance is probably unattainable for NATO even with long-range TNF modernization. Thus, long-range TNFs would not contribute directly to the deterrence of large-scale conventional attacks.

For deterrence of theater nuclear war, NATO strategy depends on a Soviet perception that its use of nuclear weapons at any level would result in a certain nuclear response that would frustrate achievement of the military objectives of the initial strikes. A long-range, land-based TNF would provide NATO with nuclear options that it currently does not have, in particular, the capability to strike back against Soviet territory *from NATO territory in Europe* and thereby gainsay any Soviet perception that its homeland might be preserved as a sanctuary. Thus, deterrence of theater nuclear attacks should be strengthened considerably. However, the actual utility of a long-range TNF may be limited in several respects.

The strong desire that the force be a visible "counter" to the SS-20, independent of the national strategic forces, and capable of quick, limited responses, implies that it be land based. But political and economic factors will restrict its peacetime deployment to a few casernes or main operating bases where it will be very vulnerable to a surprise, "out-of-the-blue" nuclear attack. Thus, NATO will have to continue to rely on U.S. strategic forces and British and French SLBMs at sea to deter such attacks. (NATO must also improve its intelligence and warning systems and decisionmaking procedures so that the possibilities of surprise attacks are minimized and its forces can be alerted, mobilized, and dispersed rapidly on warning.)

Scenarios that involve any nuclear responses against targets in the USSR must be regarded by the Europeans with considerable ambivalence. The Soviet's mobile SS-20s probably cannot be destroyed so the

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Soviet nuclear threat to Europe cannot be eliminated in a counterforce response. Numerous fixed installations such as air and naval bases, ground force casernes, ammunition depots, and air defense sites could be destroyed but if NATO cannot stop the advancing Pact ground forces from achieving their tactical objectives, what would it gain by destroying such rear-area targets? (Greatly improved target acquisition and command, control, and communications capabilities will be needed for attacks on ground force reinforcements on the march and in rear assembly areas.) At issue is what political and military objectives would the United States and NATO pursue if NATO is defeated and prostrate in Europe after an initial Soviet nuclear attack. While this situation is extremely unlikely, the uncertainties it suggests are very real in shaping European misgivings about the American nuclear guarantee against Soviet political and military aggression.

A more basic issue for the Europeans is whether or not the American nuclear guarantee would even exist in an era of strategic parity. Much of this concern has been spawned by the "Minuteman vulnerability problem" and the possibility that the United States would be deterred from any response against the USSR, even with long-range TNFs based in Europe, because its own strategic deterrent of a nuclear attack on the United States may not be adequate. Because coupling to the U.S. strategic force is the foundation of NATO security, this vulnerability problem must be resolved. Long-range TNFs must be backed up by U.S. strategic forces; they cannot stand alone against Soviet nuclear power.

Although it is asserted that long-range TNF modernization will increase coupling to the U.S. strategic force because the use of TNFs will be more credible and therefore escalation to general nuclear war will be more likely, it seems that the effect could be just the opposite. Because long-range TNFs will provide more usable and credible response options, the need to involve U.S. strategic forces will decrease and the likelihood that a nuclear war could be limited to Europe will increase. To avoid any Soviet misperceptions, the United States must take measures to make it apparent that its strategic forces can and will be used in event of a nuclear war in Europe. The resolution of the "Minuteman vulnerability problem" is critical in this respect,

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as discussed above. Other measures that tend to increase the survivability, flexibility, and utility of the strategic forces in the event of a nuclear war in Europe will be helpful, as will measures to increase NATO involvement in planning for the possible use of these forces. And to the extent possible, the United States must resolve the inconsistencies among its declaratory, arms control, force planning, and force employment policies as they pertain to the roles of U.S. strategic forces in NATO strategy.

Finally, the benefits of long-range TNF modernization will not come without some costs. There are the monetary and opportunity costs, probably several billion dollars over a ten-year period. There may also be political costs. If long-range TNF modernization is allowed to become as explosive and divisive an issue as the neutron bomb was, the European governments in power may have to overcome substantial domestic opposition to gain approval for the new forces to be based or operated on their territory or be supported with their budgets. In addition, the Soviets have already begun to exert considerable pressure on the Europeans to defeat long-range TNF modernization with the prospects for better relations with the East at stake. This makes it all the more important for U.S. policymakers to make sure that the case for long-range TNF modernization is a compelling one and to exercise great care in devising a political strategy for winning support for the systems among its NATO allies.

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PREFACE

[redacted] In December 1978, The Rand Corporation undertook a study for the Defense Nuclear Agency of long-range theater nuclear forces (TNFs) for the North Atlantic Treaty Organization (NATO). The purpose of the study was to examine the rationale and utility of these forces, while focusing on the critical strategic and political issues that will bear heavily on future deployment decisions. The following four questions were to be addressed: (1) What are the potential roles and missions of a long-range nuclear force for NATO? (2) What are the characteristics of long-range systems necessary to perform these roles and missions? (3) What is the potential effectiveness of these systems in performing the identified roles and missions? (4) What are the wider implications of deploying these systems, including political implications for the Alliance, problems of multinational control, possible political opposition within Europe to various systems and basing modes, and arms control implications?

[redacted] The results of the study, which in less than a year's effort could provide only partial answers to these questions, are presented in this report.* The body of the text is relatively short. It deals with the rationale for long-range TNF modernization, the roles and utility of long-range TNFs in NATO strategy, and what NATO can and cannot expect

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from long-range TNF modernization. Supporting analyses are presented in several appendixes and annexes. They deal with the characteristics, costs, and capabilities of alternative systems for long-range TNF modernization; the worldwide and regional balances of NATO and Warsaw Pact nuclear forces; NATO's nuclear forces that could survive and be available in a war in Europe; potential arms control constraints on long-range TNF modernization; and British nuclear forces and their relevance to NATO's plans for long-range TNF modernization.

[redacted] This report should be useful to analysts and planners in the Departments of Defense and State concerned with NATO TNF modernization, NATO strategy, SALT III, MBFR, and U.S. strategic force planning. It is especially relevant to the examination currently being undertaken by NATO's Nuclear Planning Group of the possible implications of long-range TNF modernization for the balance of roles and systems in NATO's overall nuclear strategy. This examination will form the basis of a substantive report to the Nuclear Planning Group Ministers in the fall of 1980.

[redacted] Several Rand colleagues provided valuable assistance and comments in the course of this study. They include C. L. Freeman, M. W. Hoag, C. T. Kelley, Jr., B. A. Kliszewski, F. Kozaczka, and B. S. Lambeth.

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I. INTRODUCTION

[redacted] NATO is currently considering the modernizing of its long-range theater nuclear force (TNF).* This activity began at the NATO London Summit in May 1977, where President Carter called for a series of quick fixes to reduce some of NATO's most serious military deficiencies and a bold Long-Term Defense Program (LTDP) to modernize NATO's conventional and theater nuclear forces on a cooperative basis. The Defense Planning Committee selected ten long-term priority program areas and established task forces to draft a long-term program in each. The tenth task force dealt with TNF modernization. The draft programs of the first nine task forces were presented at the NATO Washington Summit in May 1978 and were formally endorsed as NATO's LTDP for the 1980s. The tenth task force is still at work.(1)

[redacted] Much of the analytic work on long-range TNF modernization has been carried out by a so-called High Level Group, which was chartered by NATO's Nuclear Planning Group in October 1977 to support the LTDP activity. A comprehensive framework for long-range TNF modernization was established in April 1978 and a wide range of political-military issues and alternative systems have been considered since then. The issues include military rationale, operational factors, basing, survivability, targets, range, force size and mix, participation and cost sharing, and arms control. The systems include medium-range ballistic missile (MRBM),† SLBM, ground-launched cruise missile (GLCM), sea-launched cruise missile (SLCM), air-launched cruise missile (ALCM),

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† The MRBM category includes the U.S. Army Pershing II as well as various U.S. Air Force MRBM designs.

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and dual-capable aircraft (DCA). Descriptions of these systems and other options available to NATO are presented in Appendix A.

[redacted] One of the early public indications of this activity occurred in October 1977 when Chancellor Helmut Schmidt delivered a speech to the International Institute of Strategic Studies. He surfaced West German concerns about and focused Alliance attention on the gathering threat of Soviet peripheral nuclear systems, namely, the SS-20 IRBM and Backfire medium bomber.(2) The address conveyed the growing apprehension that the reordering of U.S.-Soviet *strategic* security relations could result in unacceptable political and military vulnerabilities for Europe. Chancellor Schmidt noted that

> SALT codifies the nuclear strategic balance between the Soviet Union and the United States. To put it another way: SALT neutralizes their strategic nuclear capabilities. In Europe this magnifies the significance of the disparities between East and West in nuclear tactical and conventional weapons . . . strategic arms limitations confined to the United States and the Soviet Union will inevitably impair the security of the West European members of the Alliance vis-à-vis Soviet military superiority in Europe.

The Chancellor appeared to endorse new NATO deployments sufficient to maintain a European balance in the event that the balance could not be satisfactorily restored through arms limitation agreements. He said that

> . . . we must maintain the balance of the full range of deterrence strategy. The Alliance must therefore be ready to make available the means to support its present strategy, which is still the right one, and to prevent any developments that could undermine the basis of this strategy.

Schmidt thus counterposed the moral and political necessity for arms limitations with the maintenance of a fully effective deterrent to war.

[redacted] In public discussions of long-range TNF modernization, many have simply called for a symbolic counter to the SS-20 and Backfire. Some openly wish that NATO's security could be assured through limitations

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of these new Soviet deployments. Others, further reflecting the lack of political consensus in the Alliance and within member nations, have argued about which should come first, Soviet reductions or new NATO deployments, evidently assuming that the two are discretely achievable alternatives. These views reflect a sense among the NATO allies that the current imbalance in TNFs favoring the Soviet Union presents new but ambiguous challenges to their political and military security.

[redacted] The task of ensuring both U.S. and European security interests is beset by problems that extend far beyond the immediate TNF imbalance. At the heart of present discussions on long-range TNF modernization is European confidence in the U.S. nuclear guarantee. Deterrence of nuclear war in Europe has been based on the assurance that the United States will use its strategic forces against targets in the USSR in the event of Soviet theater nuclear attacks. But in an era of U.S.-Soviet strategic parity, there is a growing concern that the United States might be deterred from such attacks. After all, the concept of parity or equal security is said to include mutual deterrence of attacks against each other's homeland. This reality plus the need to maintain a credible continuum of deterrence is one of the main reasons why NATO is planning to modernize its long-range TNFs.

[redacted] The purpose of this study is to examine the rationale and utility of long-range TNF modernization. The focus is on the critical strategic and political issues that will bear heavily on future deployment decisions. These topics are dealt with in the relatively short body of this report, which can stand alone as an "executive summary" of the results of this study. The rationale for long-range TNF modernization is discussed in Sec. II. The roles and utility of long-range TNFs in NATO strategy are considered in Sec. III. The final section suggests what can and cannot be expected from long-range TNF modernization.

[redacted] Supporting analyses are presented in the extensive set of appendixes and their annexes. Alternative systems for long-range TNF modernization are described in Appendix A. Worldwide and regional comparisons of current and projected future NATO and Soviet nuclear-capable forces are presented in Appendix B, along with an assessment

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of NATO forces that would be available in the event of a Soviet nuclear attack in Europe. The options and rationale for British nuclear force modernization and their relevance to NATO's plans are considered in Appendix C. The ability of each alternative system to satisfy the various "requirements" that have evolved for the selection of a new long-range TNF is assessed in Appendix D. These "requirements" or desired characteristics include: prelaunch survivability, defense penetration, low cost, long range, land basing, quick reaction, and selective employment. Furthermore, it is desired that the force's development be evolutionary, that its deployment and operation enable widespread Alliance participation, and that its characteristics not be constrained by SALT II. The details of the survivability analyses are presented in Appendix E. (These analyses draw extensively on the results of other system design, cost-effectiveness, weapons effects, and targeting studies.)

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II. RATIONALE

[redacted] The rationale for long-range TNF modernization comes from a set of problems that has faced NATO for many years. These include (1) the evolving Soviet nuclear threat to NATO in Europe, (2) the vulnerability of NATO's DCA and the resulting dependence on SLBMs for striking targets in the USSR, (3) the credibility of the U.S. nuclear guarantee to NATO, i.e., coupling to U.S. strategic forces, and (4) German concerns about European security and their own possible political-military isolation in an era of strategic parity and SALT between the United States and the Soviet Union. Each of these problems is examined in this section and their implications for long-range TNF modernization are discussed.

[redacted] THE EVOLVING SOVIET NUCLEAR THREAT TO NATO IN EUROPE

[redacted] The current Soviet nuclear threat to NATO in Europe includes a variety of ballistic missiles, SLCMs, and nuclear-capable medium bombers and tactical aircraft. The current numbers of delivery vehicles and weapons in each force and a projection for the late 1980s are given in Appendix B. The primary nuclear threat to NATO in Europe is the IR/MRBM force, which currently consists of about 570 old SS-4 MRBMs and SS-5 IRBMs and 100 new SS-20 IRBMs. This force alone can destroy most of the military installations in Europe that might be high-priority targets at war outbreak.*

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It is estimated that by the late 1980s the Soviets will have replaced their SS-4s and SS-5s with about 300 SS-20s and their older SRBMs and aircraft with newer models on a one-for-one basis. The overall magnitude of the Soviet threat is expected to remain about the same but its capabilities will be much greater in several respects. With the mobile MIRVed SS-20s, the Soviets will have a missile force that (1) can disperse from its fixed bases and thereby avoid attacks by NATO forces, and (2) can be used to destroy military targets and cause fewer civilian collateral casualties. With the Backfire, Fencer, and Flogger D, the Soviets will have aircraft that can strike deep into NATO territory. And with their new SRBMs, the Soviets will have longer-range and more accurate systems for battlefield support. *Of all these new systems, however, it is the SS-20 that could give the Soviets the most significant new capabilities for nuclear war in Europe. These include a secure second-strike capability and a more credible first-strike capability against fixed military targets.*

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The evolving Soviet nuclear threat to NATO in Europe, especially the SS-20, raises a critical issue for NATO: Is the threat of a general nuclear response and escalation to general nuclear war a credible deterrent of a limited nuclear attack, e.g., one in which just one-fifth of the Soviet SS-20s are used and over 98 percent of NATO's population in Europe survives? If it is not, as may be the case in the future, will NATO's surviving long-range TNFs provide other more credible response options? The first question implies the need for a long-range TNF that can survive nuclear attacks and strike back



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against military targets in the non-Soviet Warsaw Pact (NSWP) countries and the USSR.* An objective of these strikes might be to nullify any military advantage that the Pact might have obtained in its initial nuclear attacks. The second question will be addressed next.

NATO'S LONG-RANGE THEATER NUCLEAR FORCES

[redacted] However, not all are committed to NATO. None of the French nuclear forces and [redacted] MIRVs from the U.S. SLBMs are committed. And the British SLBMs can be withheld when "supreme national interests" are at stake, as discussed in Appendix C. But because all of these forces are based in Europe and operated by NATO member states, they are all considered as elements of NATO's long-range TNF in this report. Surely the Soviets would view them this way.

DNA (b)(3)

DASD (NF+ACP) (b)(1) Sec 1.3(a)(1)

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* This role for long-range TNFs in NATO's overall posture and the inadequacy of the current forces are suggested by Secretary of Defense Harold Brown in Ref. 4.

> . . . some degree of retaliatory capability against deep (especially military) targets can be usefully based in the theater as insurance and as assurance of a nuclear continuum. Accordingly, we and our NATO allies are carefully examining the adequacy of our longer-range theater nuclear capabilities. . . .

* A comparison between these NATO forces and those of the Soviet Union that can strike NATO territory in Europe from the USSR is also presented in Appendix B, along with a discussion of the intercontinental and other regional balances of current and projected future nuclear forces.

[redacted]



DIA (b)(1) (a)(3)

[redacted] The vulnerability of the land- and carrier-based DCA and the resulting dependence on the SLBMs for deterring limited nuclear attacks raise another critical issue for NATO: Can the SLBM force provide credible response options below the level of a general nuclear response? Doubts can be raised on several grounds.



DIA (b)(1) (a)(3)

[redacted]

[redacted]

[redacted] The European allies are very concerned that the United States would be deterred from using some of its strategic forces, even those based in Europe and committed to NATO, against the Soviet homeland if the continental United States (CONUS) had not been attacked first. These concerns are largely justified by the inability of U.S. strategic policies to deal with the rapid growth of Soviet strategic power. Thus they provide a strong rationale for the deployment of a long-range land-based TNF that is independent of the U.S. strategic force and survivable and flexible enough to be used in a wide range of nuclear options.

[redacted] The question of augmentation by other U.S. strategic forces raises the fundamental issue of coupling, which is the foundation of NATO defense policy.

[redacted] THE U.S. NUCLEAR GUARANTEE TO NATO

[redacted] As discussed above, the Europeans are most troubled about the uncertainty of a U.S. nuclear response against the USSR in the event of a limited Soviet nuclear attack against military targets in Europe. Because U.S. strategic forces would have to be used, they see the onus of escalation to the "strategic" level placed on the United States. They are concerned that the United States might be deterred from even a limited response with its strategic forces because it could not deter further escalation, namely, a Soviet nuclear attack against the United States. They see little in U.S. forces or policies that indicates that the United States would risk escalation to the strategic level on their behalf. Furthermore, European apprehensions are not likely to be assuaged by protestations of American will and commitment.

[redacted] The fundamental issue is therefore the use of U.S. strategic forces, including the NATO-committed RVs on Poseidon SLBMs, in the event of a nuclear war in Europe. The essence of the coupling problem from a military perspective is the dependence on U.S. strategic forces to cover targets in SACEUR's scheduled strike programs.* However, an

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[redacted] The development of targets for these programs, the Priority Strike Program (PSP) and the Tactical Strike Program (TSP), is described below.

[redacted]

DIA (b)(1) (a)(1)

[redacted]

[redacted]

American nuclear strategy that has as its premise escalation to the strategic level is increasingly seen in Europe as incredible. There is not only doubt that the United States would use its strategic forces in the event of a conventional or nuclear conflict in Europe, but that the utility of the force may be seriously compromised in future by vulnerabilities and the lack of first-strike counterforce capabilities at least comparable to those of the Soviet Union. (Many believe that the terms of SALT II give the Soviets important advantages in counterforce capabilities.)

[redacted]

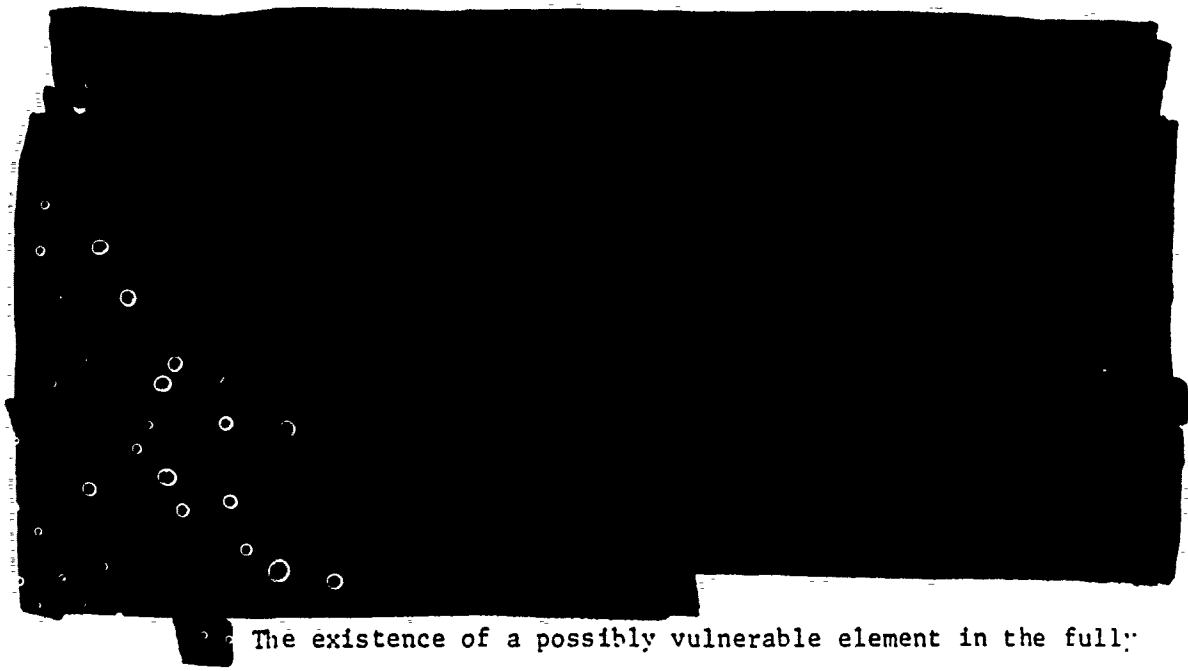
DASD (NF+ACP) (b)(1) Sec 1.3(a) (2)

[redacted]

DIA (b)(1) (a)(1)

[redacted]

[redacted]



DASD (NF+ACP) + DIA (b)(1) (a)(1)

The existence of a possibly vulnerable element in the fully generated U.S. strategic force is a serious problem because it could increase Soviet incentives for a preemptive attack against the United States. The problem is especially serious because the particular element is the ICBM force, which has the best characteristics in terms of accuracy, flexibility, responsiveness, warhead size, and reliability for attacking a wide range of military targets.(6) Thus, this possible vulnerability has more critical implications for NATO than it does for the United States alone, which has other forces it can rely on for deterring nuclear attacks on the United States. (That is the rationale for the U.S. strategic triad of bombers, SLBMs, and ICBMs, which is completely different from the NATO triad of conventional, theater nuclear, and strategic nuclear forces.) It suggests to some that the United States might be deterred from using its strategic or even long-range TNFs based in Europe because of Soviet capabilities to force the nuclear ante higher and to dominate the escalation process at the highest levels. In short, the potential vulnerability of the U.S. ICBM force undermines coupling and spawns European misgivings with respect to the U.S. nuclear guarantee. *Regardless of what new long-range TNFs are deployed in Europe, unless this vulnerability*

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[redacted]

[illegible] these new deployments may be very accurate and the [illegible] [illegible]*

(U) To a large extent, the broader coupling problem is political in nature. The United States will have sufficient nuclear weapons to cover the critical targets in SACEUR's scheduled strike programs many times over.† The "Minuteman vulnerability problem" does not exist today and it may not actually exist in the future, notwithstanding the large number of MIRVs on Soviet ICBMs and the results of simple missile duel calculations. Even if this is the case, can the Europeans be assured that the United States will use its strategic forces on behalf of NATO short of an attack on the CONUS? *In reality, the answer is* [illegible] *It is only [illegible] provide the deterrent of ac-* [illegible] *power deployed. And the Europeans should know that.*‡ Nonetheless, long-range TNF modernization can help ease European concerns about the U.S. nuclear guarantee. It will provide a visible symbol of the U.S.

[redacted] A force of MX ICBMs is one solution to this problem. However, from a NATO point of view, a much less expensive mobile ICBM system that could be deployed on military installations for dispersal on strategic warning might be adequate. This is because it is the survivability of a *fully-generated* force that is most critical for deterring war in Europe.

[redacted]

DNA (6)(3)

† [redacted] This same point was included in the text of a speech given by former Secretary of State, Henry A. Kissinger, at a conference in Brussels on "NATO: The Second Thirty Years," on 1-3 September 1979.

> The European allies should not keep asking us to multiply strategic assurances that we cannot possibly mean, or if we do mean, we should not want to execute because if we execute, we risk the destruction of civilization. Our strategic dilemma is not solved with reassurances.(7)

[redacted]

[redacted]

nuclear commitment to NATO. It can also be viewed as a "counter" to the SS-20. From a military point of view, it can provide more usable and credible options for a NATO response to a limited Soviet nuclear attack in Europe than might otherwise be possible just with U.S. strategic forces. In this sense, deterrence of Soviet nuclear attacks should be strengthened considerably. *But the long-range TNFs must be backed up by U.S. strategic forces. They cannot stand alone against Soviet nuclear power.*

[redacted] This political rationale for long-range TNF modernization has special meaning for the Germans, as will be discussed next.

[redacted] THE GERMAN PROBLEM

(U) As noted previously, European worries are that U.S. strategic forces would be nullified by the emergent situation of strategic parity, and that an adequate deterrent of Soviet theater nuclear attacks would not exist. In such a situation, Warsaw Pact conventional forces assume new military and political significance as a potential source of actual or tacit bargaining leverage. Chancellor Schmidt is reported to have said that:

> We are indeed concerned about the growing imbalance of medium-range ballistic missiles in the European theater with the deployment of the SS-20 which the United States defines as non-strategic because it cannot hit America. A ridiculous definition. Intra-European missiles are overwhelmingly strategic and could be brought to bear as a means of pressure in the European political context.(8)

[redacted] The German problem stands in contrast to that of the other NATO allies. This is why most of the political drive to modernize long-range TNFs and most of the political constraints on their deployments have emanated from Bonn. The Federal Republic of Germany (FRG) is the most exposed and vulnerable of the NATO states in the critical Central Region. Most of the high-priority military targets for Soviet nuclear attacks are on its territory. It does not view as inconceivable the possibility that the Soviets might limit their nuclear attacks to NATO's forces in Germany in order to defeat NATO with the least military effort

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while holding other NATO forces and nations hostage. If NATO does nothing to rectify the growing nuclear imbalance in the form of new deployments, it acquiesces in the new threat posed by Soviet peripheral forces. This would be a form of tacit political surrender by NATO which over time might be translated by the Soviets into political leverage vis-à-vis the FRG. Furthermore, one can imagine that under conditions of military inferiority the FRG could be prompted eventually to seek separate assurances from the Soviet Union, or that the new imbalance might incline the FRG toward acceptance of such ancillary security guarantees as the Soviet "no-first-use" proposal.

[redacted] If the FRG acts solely in conjunction with the United States in undertaking new long-range TNF deployments, it may single itself out even more as a potential target for Soviet nuclear strikes and perhaps increase Soviet incentives to limit its nuclear strikes to German territory. Moreover, U.S.-German "bilateralism" would run counter to the desire for collective security arrangements, the keystone of German defense policy.

[redacted] The introduction of new long-range TNFs into Germany alone could also prove politically destabilizing, both within the FRG and NATO. In the former case, even if sufficient political support can be mustered to generate a deployment decision, singling out Germany as the forward base of U.S. nuclear policy against the Soviet Union could give rise to a protracted domestic debate about the correctness and the liabilities of the original decision. In the latter case, within the Alliance, new deployments limited to the FRG would mean that other NATO states would not share the risk, and could have an incentive to withdraw in the event of conflict to avoid nuclear attacks on their own territories. More important, by accepting a "singular" position in nuclear affairs, the FRG would assume greater political-military prominence in Western Europe. This could result in adverse reactions from its neighbors. These concerns lie at the heart of Chancellor Schmidt's refusal to allow the FRG to operate an element of a new long-range TNF, even under a dual-key program of cooperation (POC), and his demands for broad Alliance participation in basing. Thus, deployments of new long-range TNFs solely in Germany could be very damaging to the Alliance as a whole.

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[redacted] From a political point of view, therefore, it is critical that any new long-range TNFs be deployed or operated in several countries. Such participation increases risk-sharing and strengths in the political cohesion of the Alliance. It can also make deployments more politically palatable in each country. An important strategic objective of any new deployment is to eliminate the basis for any Soviet beliefs that it may be possible to limit a nuclear war in Europe to German territory.

[redacted] The political issue of overarching importance, however, is the need to maintain the longer-term confidence of the FRG and other nations in Europe in the existing U.S.-led security structure. This too is a question of perception, and the cost of doing nothing in the way of new deployments might not be apparent for some time. But the strains could ultimately foster slippage in the U.S. position. In the short run, however, U.S. acquiescence in the TNF imbalance created by the Soviets will be perceived in Europe as a lack of political will.

[redacted] IMPLICATIONS

[redacted] The rationale for long-range TNF modernization is based on the following points. First, limited nuclear attacks by a fraction of the Soviet future SS-20 force can destroy most of the military installations and personnel that support NATO's nuclear and conventional forces in Europe. Second, the threat of a general nuclear response and escalation to general nuclear war may not be a credible deterrent of such attacks because the Soviets would still be able to strike back with equal or greater force. In other words, NATO will not be able to achieve escalation dominance or control. Third, the only element of the current long-range TNF that can survive a Soviet nuclear attack in Europe is the SLBM force, and there are doubts as to its availability for limited strikes against military targets in the USSR. The British and French forces will probably be withheld for national interests. And the Europeans are concerned that the United States would be deterred from using its strategic forces, even those SSBNs based in Europe with some MIRVs committed to NATO, against targets in the USSR if the CONUS had not been attacked first. Fourth, the growing imbalance in

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long-range, land-based TNFs between NATO and the Soviet Union in an era of strategic parity and SALT between the United States and the Soviet Union has raised European concerns, in general, and German concerns, in particular, about the future of a U.S.-led security structure in Europe.

[redacted] The implications of these points for long-range TNF modernization are that the new force must be (1) capable of effective attacks against a wide range of military targets in the NSWP countries and the Western USSR, (2) able to survive nuclear and conventional attacks, though not necessarily in the surprise, "out-of-the-blue" worst case, (3) independent of U.S., British, and French strategic forces, (4) a visible "counter" to the SS-20, (5) land based, and (6) deployed or operated in at least one other nonnuclear state than Germany. The ability of each system described in Appendix A to satisfy these and other "requirements" is assessed in Appendix D. It appears that either a ground mobile MRBM or GLCM system can provide essentially all of the capabilities NATO desires in long-range TNF modernization.

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III. LONG-RANGE THEATER NUCLEAR FORCES IN NATO STRATEGY

[redacted]

The primary aim of NATO strategy is to deter an attack before it is launched by making it clear to any aggressor that any attack would be met by a strong defense and might initiate a sequence of events involving risks far out of proportion to any advantages that might be gained. NATO must maintain capabilities to respond in an appropriate manner to any aggression. The response must be effective in relation to the level of force used by the aggressor and must make the aggressor recognize the dangers of escalation to a higher level. Thus, the burden and costs of further escalation would be shifted to the aggressor.

With respect to theater conventional war, although NATO retains the option to initiate the use of nuclear weapons, TNFs are not viewed as a substitute for conventional forces. NATO's aim is to present the Soviets with the enormous risk that a conventional war might escalate to the theater nuclear and possibly the intercontinental nuclear level.

With respect to theater nuclear war, NATO's aim is to deter Soviet use of nuclear weapons by maintaining a variety of TNFs for use on the battlefield, in the rear area, and ultimately against targets in the USSR. The efficacy of this strategy depends on a Soviet perception that initiating use of nuclear weapons at any level would result in a certain nuclear response that would frustrate achievement of the military objectives of the initial strikes. If the Soviets extended the use of nuclear weapons, they would face even higher levels of nuclear warfare where the certain penalties of such escalation would outweigh any possible gains.

This section examines the utility of long-range TNF modernization in NATO strategy. For deterrence of conventional attacks, it questions whether any NATO first use would be advantageous and suggests that escalation control or dominance is probably unattainable for NATO even with long-range TNF modernization. On the other hand, deterrence of nuclear attacks can be enhanced by long-range TNF modernization because it would provide credible nuclear options short of escalation to the strategic level, from which the United States might be deterred as long as the war is limited to Europe.

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DETERRENCE OF CONVENTIONAL ATTACKS: NATO FIRST USE

The somewhat architectonic view of the escalation process in NATO doctrine assumes a "rational" Soviet Union with incentives to minimize destruction of industrial resources and population either by not using nuclear weapons or by using them in a limited manner. Destruction would be balanced against acquisition; the Soviets would want to preserve as many resources as possible insofar as military restraint did not jeopardize military success.

A worst case for NATO is one in which the Soviets would launch a sudden conventional attack, with minimum warning and maximum violence. Their objective would be to keep NATO disoriented and achieve a strategic decision in the least possible time. (How far the Soviets would go geographically is an open question, but strategic logic would argue for overrunning Europe and denying the United States a base of operations from which to mount a counterattack.) In addition, the Soviets would want to move quickly and deeply into NATO territory to create a situation where NATO's decision to use nuclear weapons would be complicated by the fact that they would have to be used on NATO territory. The deeper the penetration, the more difficult it might be for NATO to reach agreement on nuclear release. In short, the Soviets would seek to create conditions under which NATO would be deterred from escalating the war to the nuclear level.

NATO's escalation doctrine also presumes that NATO can (a) credibly threaten to initiate the use of nuclear weapons, and (b) control and dominate escalation once the nuclear threshold has been crossed. In other words, it is assumed that NATO can expand the level and geographic area of nuclear conflict in Europe sufficiently to force the Soviets to back down at any level by credibly posing the threat of escalation to a higher level. Perceiving that it will be matched and bettered at each level, the Soviets would theoretically be deterred across the continuum of conflict situations.

Although this doctrine of escalation has gained wide acceptance in NATO circles, the military capabilities to carry it out successfully no longer exist, nor can it be expected that they will exist in the

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future because of the Warsaw Pact's growing military capabilities and its declared willingness to use nuclear weapons as necessary to defeat NATO in the event of a war in Europe.* Thus, escalation dominance or control appears to be a doctrinal chimera. In fact, it has been so ever since the United States lost its strategic superiority over the Soviet Union. Furthermore, it has been codified in SALT. Yet linkage or coupling with U.S. strategic forces continues to be viewed in NATO as the foundation of its deterrence strategy.†

On the subject of coupling, there is a fundamental contradiction between U.S. and European interests. On one hand, the Europeans seek to remove any doubt in Soviet eyes (and in their own) that the nuclear threshold will in fact be crossed if necessary. They seek a degree of coupling that will assure the Soviets of an overwhelming and decisive nuclear strike by U.S. strategic forces. Simultaneously, they seek to minimize the potential use of nuclear weapons in Europe. On the other hand, the U.S. objective is to keep the nuclear threshold as high as possible and to maintain capabilities for gradual escalation in response to theater contingencies. Paradoxically, the more options NATO has and the more graduated the capability of its TNFs, the more it may appear to the Europeans that a nuclear war could be limited to Europe. In other words, the more NATO moves to modernize its long-range TNFs, the more it may foster perceptions of decoupling.

On balance, the Europeans seem willing to proceed with some long-range TNF modernization because they are increasingly doubtful that the United States--despite protestations otherwise--would use its strategic forces against targets in the USSR. Nuclear options below the

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*Soviet doctrine for a war against NATO acknowledges that war may begin conventionally or with a limited use of nuclear weapons. However, the Soviets see escalation as likely and would attempt to preempt NATO's use of nuclear weapons with their own massive in-depth nuclear strikes.(9)

†This does not mean that this element of NATO strategy should be changed. The ambiguities, contradictions, and internal inconsistencies in NATO escalation doctrine and the disparate views of the allies raise uncertainties as to how NATO will act in a crisis or a war, which contribute indirectly to deterrence. It does mean, however, that NATO must have strong conventional defenses and other nuclear options.

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strategic level are now generally recognized as necessary to form a credible continuum of deterrence. It is argued that by increasing the risk of escalation, TNFs provide a linkage with U.S. strategic forces and thus enhance coupling.(7) However, it should also be recognized that if a large-scale conventional attack should occur, NATO would probably find itself deterred from using its long-range TNFs against targets in the USSR because the risk of a Soviet nuclear response would be unacceptable. Thus, the threat to use long-range TNFs, even if NATO was facing military defeat at the conventional level, would not be credible and these forces would not contribute *directly* to the deterrence of a conventional attack.* On the other hand, they would contribute *directly* to the deterrence of a Soviet nuclear attack on NATO in Europe, as will be discussed next.

DETERRENCE OF NUCLEAR ATTACKS: NATO SECOND STRIKES

The contingency that appears to elicit greatest concern, given new and projected Soviet capabilities, is that of limited nuclear attacks from Soviet territory against critical military targets in Europe. The Soviet incentive, it can be argued, would be to withhold nuclear strikes against other targets in Europe and any targets in the United States. The premise of the argument, as suggested earlier, is that the Soviets would seek to contain the conflict and minimize nuclear damage in the territory they would conquer. In its response to such an attack, NATO would face the decision of whether or not to strike targets in the USSR. In a sense, it has the theoretical choice of treating the Soviet homeland as a sanctuary as a means of preserving the United States as a sanctuary. In view of the inherent uncertainty of the U.S. position on this issue, the European allies are concerned that the Soviets might gamble that NATO would be deterred from attacking targets in the USSR, especially if NATO had no means of striking the USSR *in kind* from European territory. Specifically, some Europeans question whether or not in such a contingency the United States would risk retaliating against

*If a limited conventional attack should occur, or if a conventional war starts in a ragged manner, NATO's conventional forces should be able to stop the attack without nuclear weapons.

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Soviet territory even with its NATO-committed SLBM forces. The Europeans seek to deny that choice to the United States, insofar as that is possible.

German misgivings with respect to coupling also focus on the Soviet sanctuary problem. Because the Soviets would be striking the FRG with nuclear weapons *from Soviet soil*, it is feared that the United States would not respond in kind against Soviet territory with its strategic forces because of the risk that the war would escalate thereafter to the strategic level. This is not a new problem, of course. Its origin can be traced to Soviet deployment of ICBMs and SLBMs that could survive attacks by U.S. strategic forces and then retaliate against the United States. Before this, the United States could credibly threaten with relative impunity to strike targets in the USSR as appropriate to deter a war in Europe.

However problematic they may be, scenarios that involve any U.S. second strike against the USSR in the context of a European conflict must be regarded by the Europeans with considerable ambivalence. To make military sense to the Europeans, one objective of a second strike would be to eliminate Soviet *peripheral* or *Eurostrategic* nuclear assets that would have been withheld by the Soviets from their initial attack and that could be unleashed later against NATO territory. If the U.S. second strike cannot decisively degrade Soviet capabilities to retaliate against Europe, as will be the case in the future with the mobile SS-20s, what motives could the Europeans have in wanting to see it undertaken? Another objective of a second strike would be to destroy the Warsaw Pact's withheld conventional and nuclear forces and the support facilities for those forces. The latter would include air and naval bases, ground force casernes, SAM sites, ammunition depots, and command and control centers. But if NATO cannot stop the advancing Pact ground forces from achieving their tactical objectives, what does it gain by destroying rear-area targets in the NSWP countries and the Western USSR? Would the United States even launch such a second strike on behalf of a defeated and prostrate Europe and thereby risk Soviet retaliatory attacks against the CONUS? Would the Europeans want the United States to launch such a second strike when the Soviets could

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strike back against them with SS-20s and other nuclear forces? What would be the political and military objectives of the United States and NATO in this situation? While this situation is extremely unlikely, the uncertainties it suggests are very real in shaping European misgivings about the American nuclear "guarantee" against Soviet political and military aggression.

Despite these uncertainties about the likelihood and desirability of a U.S. nuclear response against the USSR, the European allies still seek to tie U.S. strategic forces inextricably to their own defense. Their strategic objective is to preclude any options on the part of the United States for noninvolvement. Ultimately, of course, they cannot ensure such coupling because the final decision for use is in U.S. hands. They would prefer, however, to link the United States as closely as possible in a community of fate. It is the credibility of this linkage and perceptions of it that they feel determine the efficacy of deterrence in Europe. Thus, doubts about the U.S. nuclear commitment and a recognition of the U.S. response dilemma are the main source of current European, and especially German, anxiety.*

The essence of the German strategic problem is the desire (by no means shared by all Germans) that the United States be able to threaten credibly to involve the Soviet homeland in a nuclear escalation process *from European territory* so as to increase German and European confidence in and Soviet perceptions of the ultimate engagement of the U.S. strategic force. In other words, if the United States maintains a long-range TNF to threaten the Soviet Union from Europe, a capability

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*It is a paradox that while uncertainties about the U.S. nuclear commitment to NATO are a matter of great concern to U.S. allies, they probably have much less effect on Soviets. On one hand, the allies want to be very confident of the U.S. nuclear commitment because their individual and collective security is at stake; they want to be sure that the U.S. strategic forces will be used in the event of war in Europe. On the other hand, given a choice of whether or not to attack NATO, the Soviets will probably be deterred by a small chance that the U.S. strategic forces will be used. They will tend to be very conservative in assessing how NATO will respond to a nuclear attack. Since there is little that can be done to reduce this uncertainty, continued public expressions of doubt and concern can be counterproductive. We should not provide the Soviets with reasons to question the U.S. nuclear commitment to NATO.

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that would gainsay any Soviet perception that the Soviet homeland might be preserved as a sanctuary, U.S. and European fates would be strategically linked and there would be little chance of U.S. noninvolvement in the event of a nuclear war in Europe. This implies that NATO should seek to structure any future long-range TNF so as to propitiate Soviet perceptions that it would ultimately risk involvement of the U.S. strategic force as a result of its own limited nuclear strikes against NATO in Europe.

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IV. CONCLUSIONS

[redacted] This section contains a brief statement of what can and cannot be expected from long-range TNF modernization. The former summarizes the rationale discussed in the preceding sections. The latter is included to place long-range TNF modernization in perspective because it is just one of many problems addressed in NATO's LTDP. Some other measures that need to be taken by the United States and its allies to achieve a balanced force posture and strategy are also discussed. Without them, long-range TNF modernization will be little more than an expensive facade.

[redacted] WHAT CAN BE EXPECTED FROM LONG-RANGE TNF MODERNIZATION?

[redacted] Long-range TNF modernization can provide several important political and military benefits for NATO. On the other hand, there are some monetary and other costs.

[redacted] In the political area, the benefits include easing European concerns about the growing Soviet nuclear threat, primarily the SS-20 and Backfire, and specific German concerns about political-military isolation within the Alliance and U.S.-FRG "bilateralism." With respect to arms control, as discussed in Annex 3 of Appendix D, long-range TNF modernization could provide some bargaining leverage in limiting or reducing the Soviet nuclear threat to NATO in Europe.

[redacted] In the military area, the primary benefits are in strengthening deterrence across the whole range of possible conflicts. Most importantly, a new land-based long-range TNF would provide more credible options for responding to limited nuclear attacks against military targets in that they would not need to involve U.S. SLBMs and other strategic forces or British and French independent nuclear forces that might be withheld for national targeting. Though perhaps not so credible but nonetheless of great concern to the Soviets would be the force's preemptive attack capabilities. For example, in contemplating a surprise nuclear or conventional attack on NATO, the Soviets must realize that NATO's quick reaction alert (QRA) force alone could cause

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enormous damage to its land, sea, and air forces in the Western USSR and NSWP countries, most of which would be in their normal peacetime posture at a few hundred locations. Then, in the case of a surprise conventional attack, the Soviets must realize that the QRA force could strike back quickly against its mobilizing forces, many of which may still be in their home casernes, as well as a wide range of rear-area targets, including air bases, naval ports, missile bases, logistics facilities, and troops in assembly areas.* These would also be lucrative targets for a nuclear response to a conventional attack against an alerted and mobilized NATO. Even though it will be argued below that NATO may actually be deterred from such nuclear first use, the Soviets may still be deterred from conventional attacks because of the possibility that NATO might strike back with nuclear weapons and the conflict would escalate to general nuclear war.

[redacted] These benefits will not come without some costs. First, there are the monetary and opportunity costs, probably several billion dollars over a 10-year period.† With limited defense budgets, monies for long-range TNF modernization will not be available for other, perhaps more critical, programs. There may also be political costs. If long-range TNF modernization is allowed to become as explosive and divisive an issue as the neutron bomb was, the governments in power may have to overcome substantial domestic opposition to gain approval for the new forces to be based or operated on their territory or be supported with their budgets. In addition, the Soviets have already begun to exert considerable pressure on the Europeans to defeat long-range TNF

[redacted] The Soviets would face the following dilemma. If they do not mobilize and disperse their forces before D-day, they are more likely to achieve surprise. But then their forces would be highly concentrated and vulnerable to a preemptive nuclear attack. On the other hand, if they do mobilize and disperse their forces before D-day, their chances of a successful surprise attack are decreased. While the survivability of their forces would increase, at least to the extent that they cannot be targeted, NATO's nuclear and conventional forces would also gain in survivability by dispersal on warning of Pact mobilization.

[redacted] Some cost estimates for the various long-range TNF modernization options are included in Appendix D.

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modernization with the prospects for better relations with the East at stake. These potential political problems are also discussed in Annex B of Appendix D.

[redacted] Finally, there is a potential strategic cost. Although it is asserted that long-range TNF modernization will increase coupling to the U.S. strategic force because the use of TNFs will be more credible and therefore escalation to general nuclear war will be more likely, it seems that the effect could be just the opposite. Because long-range TNFs will provide more usable and credible response options, the need to involve U.S. strategic forces will decrease and the likelihood that a nuclear war could be limited to Europe will increase.

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DNA (b)(3)

DIA (b)(1) (a)(1)

DASD (NFL ACP)

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WHAT CANNOT BE EXPECTED FROM LONG-RANGE TNF MODERNIZATION?

First of all, long-range TNF modernization cannot be expected to provide usable and credible nuclear options for NATO first use or deliberate escalation. If deterrence fails and the Warsaw Pact attacks with conventional (and perhaps chemical) weapons, NATO could well be deterred from launching nuclear strikes against rear-area targets because the Soviets can respond in kind. NATO's rear area is much smaller and contains fewer critical installations, such as air bases, ports, and supply depots. Thus NATO could be damaged more than the Pact in such nuclear strikes. In other words, such escalation might only increase NATO's losses and hasten its military defeat. Long-range TNFs will not be an effective substitute for inadequate conventional and battlefield nuclear capabilities. NATO should be able to stop the advancing Pact ground forces before any rear-area nuclear attacks are considered. Also, greatly improved target acquisition and command, control, and communications (C^3) capabilities will be needed if long-range TNFs are to be used against ground force reinforcements on the march and in rear assembly areas.

A new land-based long-range TNF will not of itself provide a *military* counter to the SS-20 and other Soviet mobile missile systems. The critical problem in attacking these forces is target acquisition. Although not examined in this study, it seems unlikely that NATO will have a wartime capability to locate dispersed and hidden SS-20s in the Western USSR.

Finally, a new land-based long-range TNF will not enhance deterrence of a surprise, "out-of-the-blue" nuclear attack. Actually, the fact that the force will be very vulnerable to such attacks on its casernes or MOBs provides an additional incentive for the Soviets to attack before the force can disperse. NATO will have to continue to rely on U.S. strategic forces and British and French SSBNs at sea to deter such attacks. NATO must also improve its intelligence and warning systems and decisionmaking procedures so that the possibilities of surprise attacks are minimized and its forces can be alerted, mobilized, and dispersed rapidly on warning.

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Appendix A

LONG-RANGE THEATER NUCLEAR FORCE MODERNIZATION OPTIONS

[redacted] This appendix contains a brief description of the missile and basing options that have been considered in long-range TNF modernization.

[redacted] MISSILES

[redacted] Cruise and ballistic missiles have been considered for each basing option.

[redacted] Cruise

[redacted] Ground-, air-, and sea-launched cruise missiles are currently being developed in the United States. Their characteristics (approximate) are listed below:

[redacted]

Length	6 m
Diameter	52 cm
Weight	1200 kg
Number of warheads	[redacted]
Warhead yield	[redacted]
Range	[redacted]
Speed	0.80 mach (maximum) .55 mach (cruise)
CEP with TERCOM guidance	[redacted]

DNA (b)(3)

The ALCM will have an initial operational capability (IOC) in late 1982 with the B-52G. The antiship SLCM with a conventional warhead will have an IOC in mid 198_ on a submarine and mid 1983 on a surface ship. The land-attack SLCM with a nuclear warhead could have an IOC in late 1983; however, no production is planned for it at this time. The GLCM could also be operational in late 1983.

[redacted]

[redacted]

[redacted] Ballistic

[redacted] The Pershing II MRBM is currently being developed by the U.S. Army. Its characteristics are listed below:

[redacted]

Length	10.6 m
Diameter	102 cm
Weight	6900 kg
Number of warheads	[redacted]
Warhead yield	
Range	1800 km
CEP with radar area correlator guidance and a maneuvering RV (MaRV)	[redacted]

DNA (b)(3)

Engineering development of Pershing II was approved by the Defense Systems Acquisition Review Council (DSARC) in December 1978. An IOC is estimated for mid 1985.(10)

[redacted] The U.S. Air Force is currently studying several ground- and air-launched MRBM designs. The characteristics of single ballistic reentry vehicle (BRV) and MIRVed missiles are given below:

[redacted]

	BRV	MIRV
Length	6.7-7.3 m	7.0-8.5 m
Diameter	60-66 cm	109-117 cm
Weight	2300-2700 kg	5000-6600 kg
Number of warheads	[redacted]	
Warhead yield		
Range	2500 km	2500 km
CEP with stellar inertial guidance	[redacted]	

DNA (b)(3)

Assuming approval for engineering development in the fall of 1980 and an *accelerated* program thereafter, an IOC might be possible in mid 1985. However, if the time between DSARC II and IOC is six years, as planned in the Pershing II program, an IOC would be reached in late 1986.(11)

[redacted]

[redacted]

[redacted]

DNA (6)(3)

[redacted] BASING

[redacted] The main basing options considered include: fixed, ground mobile, air mobile/ground launch, air mobile/air launch, and submarine or ship launch. Missiles on DCA have also been considered.

[redacted] Fixed

[redacted]

DNA (6)(3)

[redacted] Ground Mobile

[redacted] In this system the missiles, launchers, and C^3 equipment would be mounted on trucks and trailers for road and off-road mobility. These vehicles are called transporter/erector/launchers (TELs) and launch control vehicles (LCVs). They would normally be located in hardened shelters

[redacted]

DASD (NP HACP) (6)(1) Sec. 1.3.(a) (1)(2)

[redacted] A parametric analysis of silo survivability is presented in Annex 1 to Appendix E.

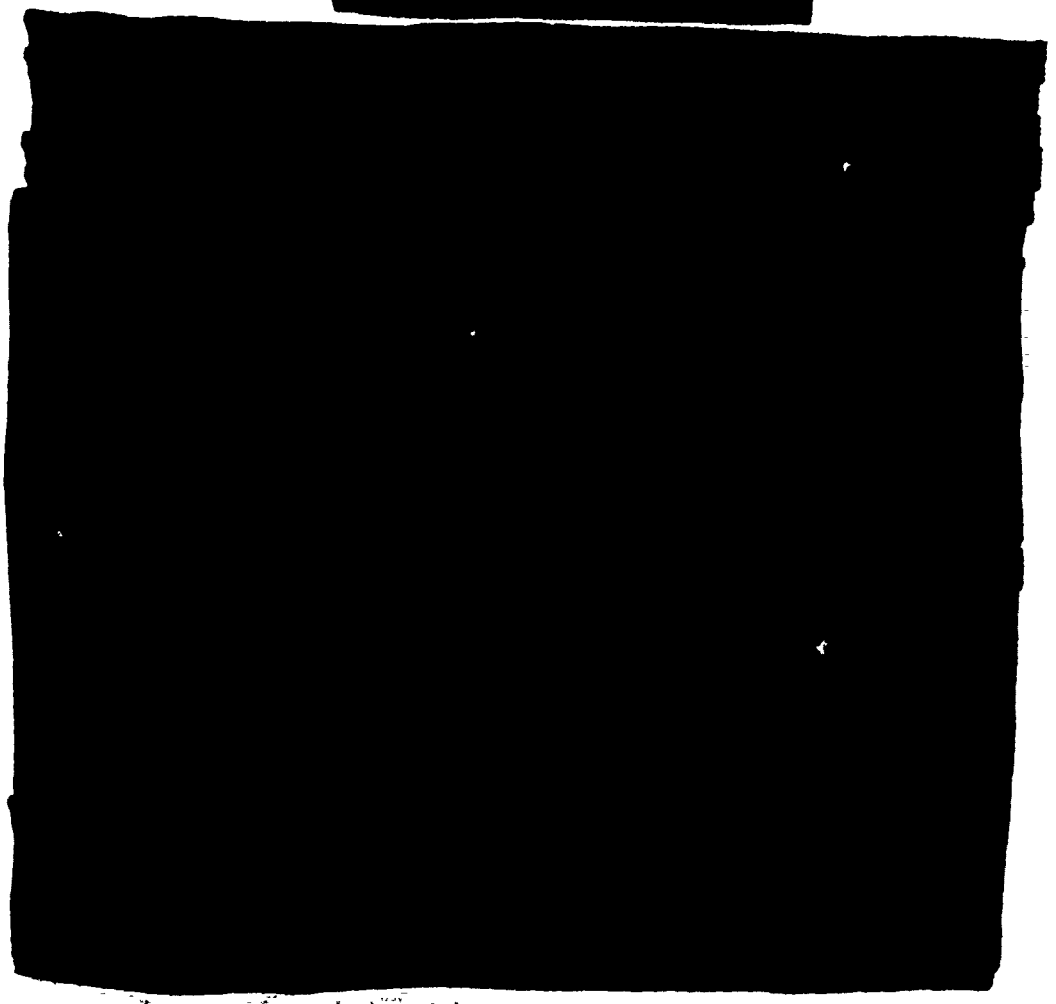
[redacted]

[redacted]

Table A.1

[redacted] MILITARY AIR BASES FOR POSSIBLE SILO LOCATIONS

[redacted]



DNA (b)(3)

on a few MOBs or home casernes and be ready to disperse to covert field positions on command during a period of increasing international tension. The firing units would move every day or so in the field to reduce their chances of being located and targeted. (Such field deployments are not considered to be feasible in peacetime.) In the Army's concept for Pershing II operation, the support elements would also disperse; thus, the entire system would be ground mobile and independent of its home casernes during a contingency.[13] In the Air Force's

[redacted]

[redacted]

[redacted]ept for GLCM and MRBM operation, the support elements would remain on the MOBs.(14) Some other differences among MRBM and GLCM system concepts are indicated in Table A.2.

[redacted] In a variant of this concept, some of the firing units might be moved by air to other airfields from which they would then disperse on the ground. Such movements would substantially increase the operating areas of the system. The Air Force autonomous TEL (AutoTEL) is specifically designed to fit into a single C-130. A complete single-BRV MRBM firing unit can be moved in 7 C-130s. This contrasts with 16

[redacted] Table A.2

[redacted] GROUND-MOBILE SYSTEMS

[redacted]

DNA (b)(3)

[redacted]

[redacted]

C-130s needed to move a GLCM firing unit or a GLCM-common, single-BRV MRBM firing unit.*

[redacted] Air Mobile/Ground Launch

[redacted] This system consists of missiles in canisters on an austere erector/launcher (EL). The missile's C^3 equipment and power supply would be installed in a transport aircraft. The aircraft and missiles would be kept on an MOB during peacetime. On command in a crisis, the aircraft would fly to dispersal airfields where the missiles would be placed on alert. Thus, the aircraft is an integral part of the system and the system must operate from an airfield. One C-130 might carry four single-BRV MRBMs, four GLCMs, or one MIRVed MRBM on a single EL. Some aircraft might be kept airborne for enhanced survivability but they would have to land to fire their missiles. (Airborne alert is not considered to be feasible in peacetime.)

[redacted] With C-130 aircraft, most airfields with paved runways longer than 1200 m might be used for contingency dispersal operations. The numbers of such airfields in the United Kingdom, France, and Italy are shown in Table A.3.† Since the main purpose of dispersal is to enhance survivability, the aircraft would not disperse to air bases with combat aircraft because those air bases would probably be high-priority targets

---

* [redacted] Air movements might occur during peacetime in training exercises and demonstrations of Alliance participation and on command during a period of increasing international tension. Existing theater airlift aircraft would be used for these movements, i.e., dedicated aircraft would not be procured. During a contingency deployment and after war outbreak, some continued airlift will be needed to support the firing units at their remote operating areas.

† [redacted] Another possibility that has been considered for an AutoTEL system is a partial deployment in the CONUS. In one concept there would be two MOBs in Europe and one in the CONUS. The AutoTELs at the latter would be moved to Europe by strategic airlift aircraft during the first weeks of mobilization.

[redacted]

DNA (6)(3)

[redacted]

[redacted]

Table A.3

[redacted] POSSIBLE AIRFIELDS FOR C-130 DISPERSAL OPERATIONS[a]

[redacted]

DASD (NF+ACP) (b)(1) See 1.3(a)(1),(3)

in a war. However, the aircraft could disperse to civil and other military airfields. There are about 320 such airfields in the United Kingdom, France, and Italy. Support for the system can be dispersed to some of these airfields or it can remain at the MOBs.

[redacted] If the number of missiles or RVs per MOB is about the same in this system as in a ground-mobile system, there would be 40 to 50 C-130s at each MOB. New MOBs would have to be developed for this system because there are no existing MOBs in Europe with enough space for such a bed-down. In one concept, there would be two MOBs in Europe and one in the CONUS. Aircraft from the latter would deploy to Europe during the first days of NATO mobilization.

[redacted] Air Mobile/Air Launch

[redacted] In this system the missiles would be carried on dedicated launch aircraft. Table A.4 shows the number of air-to-surface ballistic

[redacted]

[redacted]

[redacted] Table A.4

[redacted] NUMBER OF MISSILES ON LAUNCH AIRCRAFT

[redacted]

[redacted]

DASD (NF+ACP) (b)(1) Sec 1.3(a) (1),(2)

missiles (ASBMs) or ALCMs that can be carried on C-130s and C-15s. The aircraft and missiles would be kept on a MOB during peacetime. On command in a crisis, some aircraft would go on airborne alert and the rest would disperse to other airfields, as in the air-mobile/ground-launch system. However, in this system, the aircraf would have to take off to fire their missiles.

[redacted] With ASBMs, if missiles at each MOB have about 150 RVs, about 25 C-130s or 12 C-15s would be located at each MOB. With ALCMs, about one-half as many launch aircraft would be needed. Such beddowns might be possible on some existing MOBs in Europe. As in an air-mobile/ground-launch system, one MOB might be located in the CONUS.

[redacted] Submarine or Ship Launch

[redacted] Attack submarines and principal surface combatants can carry SLCMs in addition to their other armaments. Table A.5 shows the numbers of such ships currently in the navies of each NATO nation.(15) The number of SLCMs that might be carried on each type of ship is also shown. These ships would operate in their primary naval roles and would not be dedicated to NATO's long-range TNF as are the SSBNs.

[redacted]

DIA (b)(1) (a)(1)

[redacted]

[redacted]

Table A.5

[redacted] POSSIBLE NAVAL FORCES FOR SLCMS

[redacted]

DNA (b)(3)

DASD (NF+ACP) (b)(3) + (b)(1)

See 1.3(a) (1),(2); (3)

[redacted] Dual-Capable Aircraft

[redacted]

DIA (b)(1) (a)(1)

[redacted]

[redacted]

[redacted] It is expected that NATO will continue to maintain a substantial number of DCA in Europe. Table A.6 shows the numbers and types of aircraft by location and nation for the late 1980s.

DASD (NFTACP) (b)(1) 1.3(a) (1)

DIA (b)(1) (a)(1)

[redacted]

Table A.7 shows the numbers of air bases on which the land-based DCA will be located.

[redacted]

[redacted]

Table A.6

[redacted] NATO DUAL-CAPABLE AIRCRAFT IN EUROPE
IN THE LATE 1980s

[redacted]

[redacted]

DNA
(b)(3)

[redacted]

[redacted]

Table A.7

AIR BASES FOR NATO DUAL-CAPABLE AIRCRAFT

[redacted]

[redacted]

DNA (b)(3) (b)(1) Sec 1.3(a) (1)

[redacted]

[redacted]

Appendix B

NATO AND WARSAW PACT NUCLEAR-CAPABLE FORCES

[redacted] This appendix presents a worldwide and several regional comparisons of current and projected future NATO and Warsaw Pact (Soviet) nuclear-capable forces.* The annex to this appendix provides some details on NATO's future longer-range forces that might be available in the event of a nuclear war in Europe and on their survivability to nuclear attacks at war outbreak.

WORLDWIDE FORCES

[redacted] Table B.1 shows current and projected future (late 1980s) worldwide totals of NATO and Soviet nuclear-capable forces with ranges at least 3[illegible] km.** The most significant aspects of these balances are outlined below:

1. [redacted] The current balance:

   a. [redacted]

DASD (NF+ACP) (b)(1) Sec 1.3(a) (1),(2),(3),(4)

[redacted] French nuclear forces are included even though they are not committed to NATO. However, the French tend to consider their nuclear forces as complementary to those of NATO and they do support the concept of INF modernization as developed by the High Level Group.(15) In all probability, the Soviets are considering the possibility that France would cooperate fully with NATO in the event of a war in Europe.

[redacted] It is recognized that the delivery vehicle and weapon counts presented in this appendix provide only a very rough measure with which to compare forces. However, they are the ones that are most widely used and understood--or misunderstood, as often argued by the side with the smaller forces. They are also the easiest to develop, and since an assessment of the nuclear balance is beyond the scope of this study, they are used here. References 19, 20, and 21 and other threat projections were used for Soviet forces. References 4, 15, and 16 were used for NATO forces.

[redacted]

[redacted]

[redacted] Table B.1

[redacted] NATO AND SOVIET NUCLEAR-CAPABLE FORCES: WORLDWIDE TOTALS

[redacted]

Force	Delivery Vehicles/Weapons			
	Current		Late 1980s	
	NATO	Soviet	NATO	Soviet
ICBM	[redacted]			
SLBM				
IR/MRBM				
SRBM				
SLCM				
Missile Totals				
Heavy Bomber				
Medium Bomber				
Tactical Aircraft				
Aircraft Totals				
Force Totals				

DNA (6)(3)

DASD (NF+ACP) (b)(1) Sec. 3(a) (1)(2), (3), (4)

DNA (b)(3)

NOTE: The following assumptions are made in counting nuclear-capable forces:

1. Very short-range land- and sea-launched nuclear missiles (less than 300 km), artillery, air defense, atomic demolition munitions (ADMs), and [redacted] systems are not included.

2. The SALT II Treaty limits are in effect.

DNA (b)(3)

3. [redacted]

4. [redacted]

5. [redacted]

[redacted]

[redacted]

Table B.1--continued

[redacted]

6. Each missile has one nuclear weapon except those that are MIRVed. Each MIRV is counted as one weapon. An MRV cluster is counted as a single weapon.

[redacted]

DASD (NF+ACP) (b)(1) see 1.3 (a) (1)(2), (3), (4)

DNA (b)(3)

11. No new long-range TNFs are included for NATO, although some GLCMs and Pershing II MRBMs may be deployed by the late 1980s.

[redacted]

[redacted]

b. [redacted]

DASD (NUF+ACQ) (b)(1) Sec 1.3 (a) (1), (2), (3), (4)

2. [redacted] **The projected future (late 1980s) balance:**

a. [redacted]

b. [redacted]

3. [redacted] **NATO trends:**

a. [redacted] The number of delivery vehicles will remain about the same.

b. [redacted]

4. [redacted] **Soviet trends:**

a. [redacted]

b. [redacted]

[redacted]

[redacted]

[redacted] Although these delivery vehicle and weapon totals do not measure opposing military capabilities, they do indicate that (1) there is currently a rough balance in force totals, (2) this balance will continue during the 1980s, (3) both sides maintain very high levels of nuclear-capable forces, and (4) there are significant differences in the composition of the opposing forces. The latter is because about 65 percent of the Soviet delivery vehicles and 45 percent of their weapons are on peripheral systems, whereas NATO's percentages are 35 and 15, respectively.* The bulk of NATO's nuclear strength lies in U.S. strategic forces and DCA located in the CONUS, as indicated in Table B.2.

[redacted] Table B.2

[redacted] U.S. AND NON-U.S. NATO NUCLEAR-CAPABLE FORCES: WORLDWIDE TOTALS

[redacted]

DNA (6/3)

[redacted] For the Soviet Union, only its intercontinental nuclear forces (ICBMs, SLBMs, and heavy bombers) are not considered to be peripheral. For NATO, U.S. strategic forces (ICBMs, SLBMs, and heavy and medium bombers) and DCA located in the CONUS are not considered to be peripheral.

[redacted]

[redacted]

REGIONAL FORCES

[redacted] The regional force balances shown in Table B.3 shed additional light on the important differences between NATO and Soviet nuclear-capable forces. Five balances are considered. The first is between intercontinental nuclear forces based in the CONUS and the USSR. This includes all Soviet and U.S. intercontinental nuclear forces except the U.S. SSBNs operated from locations in Europe and the Pacific. The second is between NATO forces based in Europe that can reach the Western USSR and Soviet forces in the Western USSR that can reach NATO territory. The third is between NATO forces based in Europe that *cannot* reach the Western USSR and Soviet forces in the NSWP countries than can reach NATO territory. [redacted] The fifth is between U.S. forces in the CONUS and Soviet forces in the Central and Eastern USSR that cannot reach NATO territory from their home bases.

DNA (6)(3)

U.S. and Soviet Homeland-Based Intercontinental Nuclear Forces

[redacted] Except for the U.S. SLBMs operated from locations in Europe and the Pacific, the forces included in Table B.3(a) are the strategic forces covered in SALT II. A rough equivalence is generally believed to exist at present with the United States having more SLBM and bomber weapons and the Soviets having more ICBM weapons. The Soviets have more air defenses but the United States is ahead in ASW. These asymmetries and an overall rough equivalence are expected to continue in the 1980s. However, as Soviet MIRVed ICBMs become more accurate, a small fraction of them may be able to destroy a large fraction of the U.S. ICBM force. For the future, although not included in the projected U.S. force, a mobile MX ICBM force is planned. It will be much more survivable than the current silo-based force.

[redacted] Notwithstanding the possible vulnerabilities of bombers and fixed ICBMs and the more certain vulnerabilities of non-alert bombers and SSBNs in port, it appears that neither side now has or will have in the 1980s a disarming first-strike capability against the other. Enough

[redacted]

[redacted]

Table B.3

[redacted] NATO AND SOVIET NUCLEAR-CAPABLE FORCES: REGIONAL TOTALS

[redacted]

[redacted]

DNA (b)(3)

DIA (b)(1) (a)(1)

[redacted]

[redacted]

of each side's strategic forces should survive a first strike by the other, especially if forces are fully generated, to deter such attacks. Limited nuclear attacks only against nuclear forces and other targets should be deterred by the expected damage from a limited nuclear response and the risk of escalation to general nuclear war. This reality is especially significant in the event of war in Europe. First, the Soviets should be deterred from nuclear attacks against targets in the CONUS at the outbreak of a nuclear war in Europe. And second, the United States should be deterred from nuclear attacks against targets in the USSR in response to a Warsaw Pact conventional attack in Europe.* In other words, in an era of nuclear parity between the United States and the Soviet Union, it is unlikely that the United States *would actually use* its strategic nuclear forces against the Soviet Union to "defend" NATO against a Warsaw Pact conventional attack.

[redacted] This does not mean that the *threat* to use *strategic* nuclear forces against the Soviet Union does not contribute significantly to deterrence of conventional attacks or that such a threat should not be an important element of NATO's defense strategy. In fact, the risk of escalation to general nuclear war and the possible use of these forces is probably the most significant factor in the deterrence equation. It simply means that if deterrence fails and a conventional war breaks out, the actual use of these forces would be considered anew. The decision to risk escalation to general nuclear war would pass to NATO. And NATO would probably be deterred.

[redacted] NATO Long-Range TNFs in Europe and Soviet Peripheral Forces in the Western USSR

[redacted] Table B.3(b) shows one part of the balance of nuclear-capable forces in Europe. It includes Soviet peripheral forces located in the Western

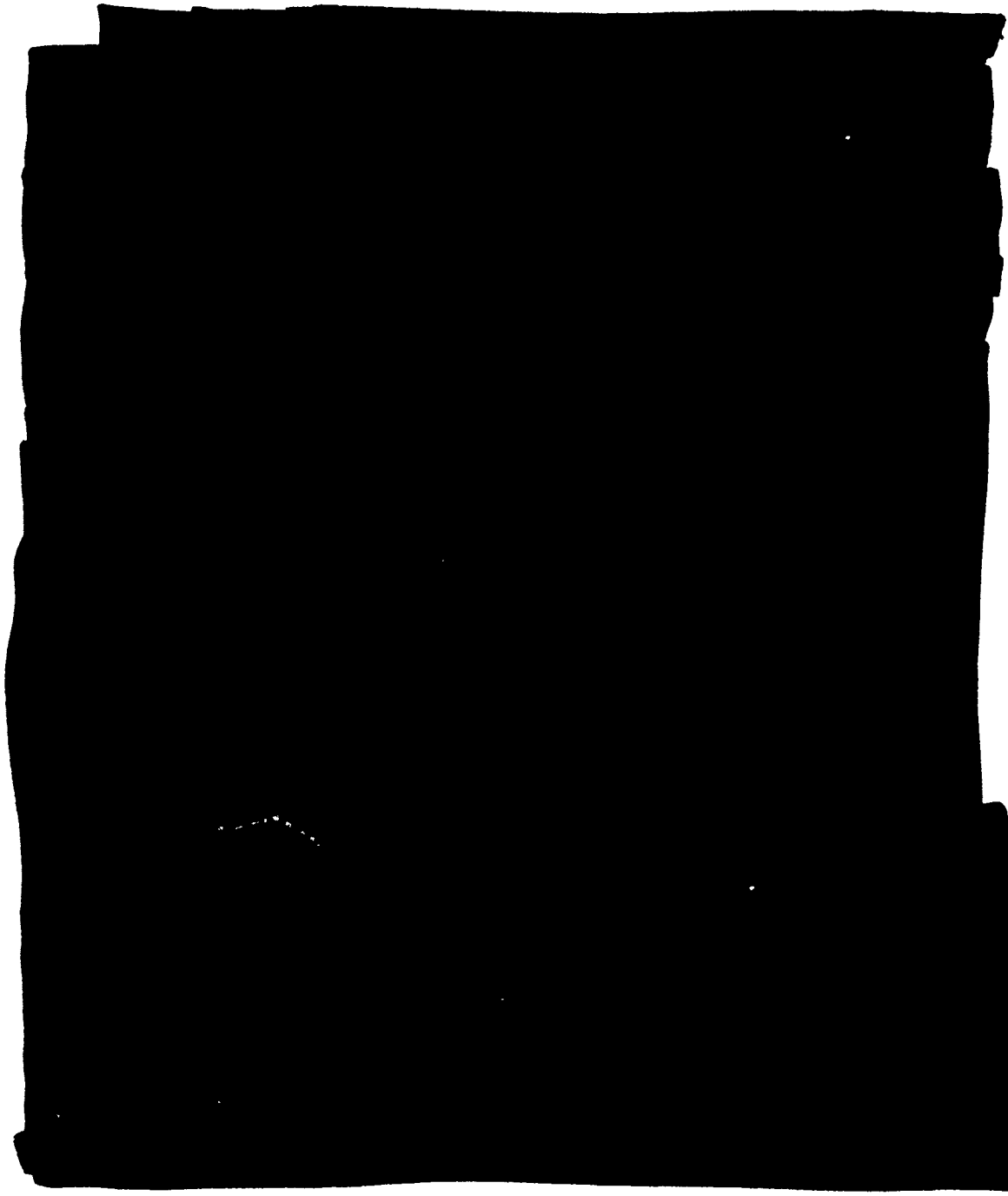
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[redacted] It is stated in Ref. 9 that the only escalation boundary that can be inferred from the Soviet unclassified literature is the boundary between theater nuclear and intercontinental general nuclear war. Further, the Soviets apparently view the recent changes in the nature of the strategic forces and in the strategic power balance as significantly lowering the risk of escalation from theater to intercontinental war.

[redacted]

[redacted]

USSR that can reach NATO territory and NATO long-range TNFs based in Europe that can reach the Soviet homeland.



DNA (6)(3)

DIA (6)(1) (a)(3)

DNA (6)(3)

[redacted] A more detailed description of NATO's future theater and intercontinental nuclear forces and some estimates of their survivability and availability in the event of a nuclear war in Europe are presented in the annex to this appendix.

[redacted]

[redacted]

[redacted]

NATO TNFs in Europe and Soviet TNFs in NSWP Countries

[redacted]

DASD (NF+ACP) (b)(1) Sec 1.3(a) (1),(2),(4)

U.S. Nuclear-Capable Forces in the Pacific and Soviet Peripheral Forces in the Far Eastern USSR

[redacted]

DNA (b)(3)

[redacted] However, much of the Soviet buildup in the Eastern USSR is directed against China. And the U.S. Trident SSBNs will still operate in the Pacific.

[redacted]

[redacted]

[redacted] DNA (6)(3)

[redacted] Other U.S. and Soviet Forces

[redacted] Table B.3(e) shows the balance of reserve SRBMs and tactical aircraft in the CONUS and the Central and Eastern USSR. These forces would have to be deployed forward to be used in a war. The total numbers are about equal, with the Soviets having more SRBMs and the United States having more aircraft.

DIA (6)(1) (4)(1)

[redacted]

DNA (6)(3)

[redacted]

[redacted]

Annex to Appendix B

NATO'S LONGER-RANGE NUCLEAR FORCES FOR A WAR IN EUROPE

DELIVERY VEHICLES AND WEAPONS

The longer-range nuclear forces that could be available to NATO early in a war with the Warsaw Pact in Europe include the long-range TNFs, all other U.S. strategic forces, the Pershing Ia SRBMs based in Europe, and the short-range DCA based in Europe and those planned for deployment from the CONUS by M+10. The numbers of delivery vehicles and weapons projected for the late 1980s for each existing system are given in Tables B.4, B.5, and B.6. Land-based ICBMs, IRBMs, and SRBMs are included in Table B.4; SLBMs are in Table B.5; and nuclear capable aircraft are in Table B.6.

Table B.4

LAND-BASED INTERCONTINENTAL, INTERMEDIATE-RANGE, AND SHORT-RANGE BALLISTIC MISSILES IN THE LATE 1980s

[redacted]

[redacted]

DNA (6)(3)

[a]Individually targetable.

[redacted]

DNA (6)(3)

[redacted]

[redacted]

Table B.5

[redacted] SUBMARINE-LAUNCHED BALLISTIC MISSILES IN THE LATE 1980s

[redacted]

[redacted]

DNA (b)(3)

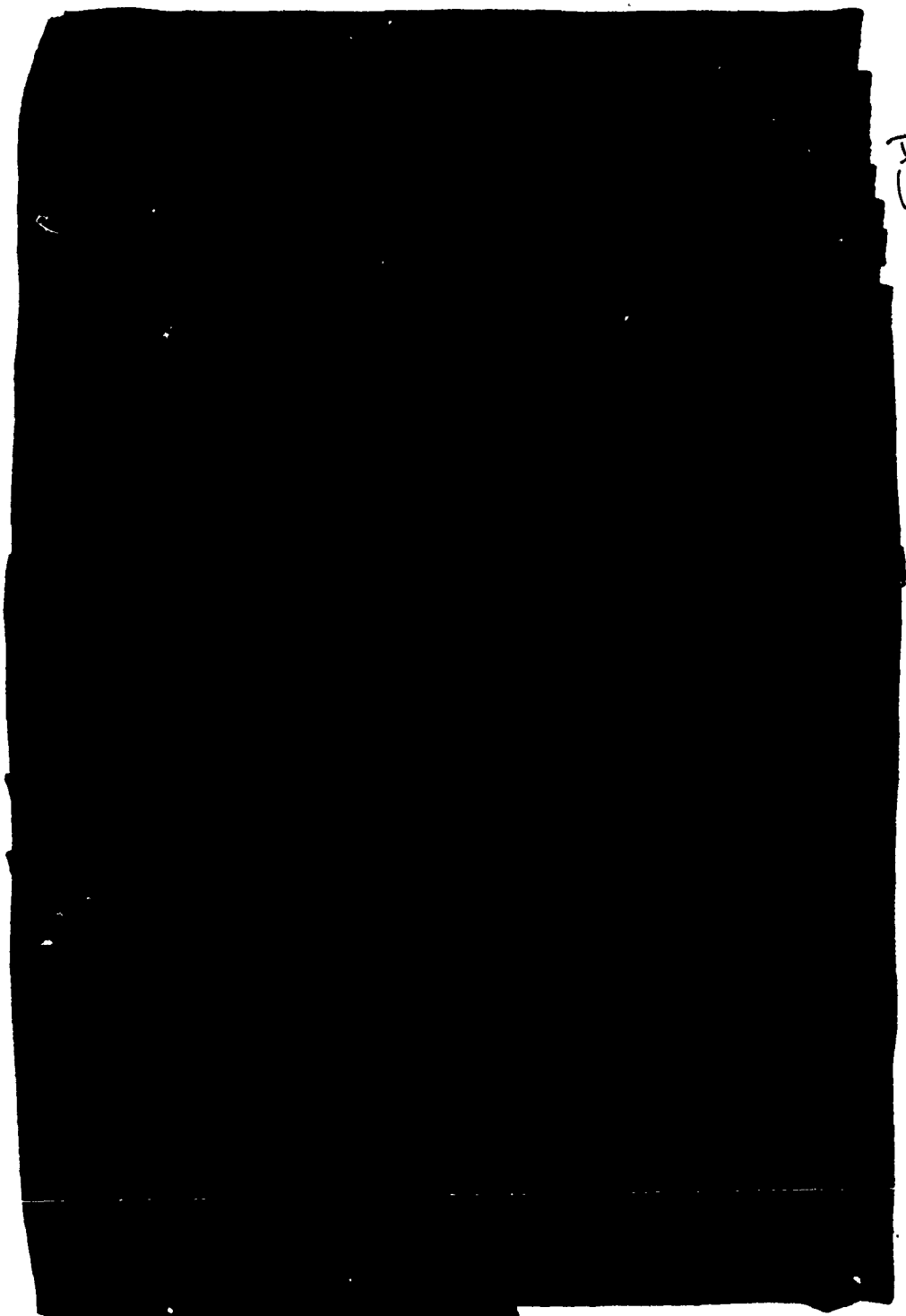
[redacted]

[redacted]

Table B.6

NUCLEAR-CAPABLE AIRCRAFT IN THE LATE 1980s

[redacted]



DASD (NF+ACP) (b)(1) Sec 1.3(a) (1)

DNA (b)(3)

[redacted]

Page 75 is deleted DASD (NF+ACP) (b)(1) Sec 1.3(a) (1)(2),(3), + DNA (b)(3)

[redacted]

[redacted]

DNA (b)(5)

[redacted] SURVIVING FORCES

[redacted] To assess the deterrence capabilities of NATO's longer-range nuclear forces, the numbers of delivery vehicles and weapons that would be available after a Warsaw Pact nuclear attack in Europe are shown in Table B.7 as a function of NATO mobilization time before D-day. Available forces are defined as: (1) all U.S. ICBMs and intercontinental bombers in the CONUS and DCA deployed in Europe on D-day; (2) all SLBMs on on-line SSBNs; (3) IRBMs and Pershing Ia SRBMs in-Europe; and (4) all non-U.S. NATO DCA in strike/attack squadrons.

DASD (NF+ACP) (b)(1) Sec 1.3(a) (1)(2)(3)

[redacted]

The numbers of these targets as a function of NATO mobilization time before D-day are shown in Table B.8. [redacted]

[redacted]

[redacted]

Table B.7

[redacted] NATO'S LONGER-RANGE NUCLEAR FORCES AVAILABLE BEFORE AND AFTER A WARSAW PACT NUCLEAR ATTACK IN EUROPE

[redacted]

DNA (b)(3)

Page 78 is deleted. (b)(3)

[redacted]

[redacted]

Table B.8

[redacted] NATO'S LONGER-RANGE NUCLEAR FORCE TARGETS FOR WARSAW PACT NUCLEAR ATTACKS IN EUROPE ON D-DAY

[redacted]

[redacted]

DNA (6)(3)

Page 80 is blank.

[redacted]

[redacted]

Appendix C

[redacted] BRITISH AND NATO NUCLEAR FORCE MODERNIZATION

[redacted] Over the next few years the British will be faced with critical decisions regarding the future of their independent nuclear deterrent force as well as the doctrine that governs its deployment and possible use. Because this force and British nuclear doctrine are important elements in the European nuclear force balance, the decisions that the British make will affect NATO's plans for long-range TNF modernization.

[redacted] This appendix examines the relationship between British and NATO nuclear forces. It begins with a review of the current status of Britain's independent deterrent force and then turns to some of the doctrinal considerations that apply to force modernization. The next subsections describe the options available to the British for replacing their Vulcan fleet in the early 1980s and their Polaris fleet in the early 1990s and some of the political and economic factors that will affect their choices. The final subsection discusses Britain's potential contributions to NATO's long-range TNF modernization and assesses the relevance of its efforts to the various political and military concerns that are driving NATO in this area.

[redacted] BRITISH NUCLEAR FORCES

[redacted]

[redacted] Polaris

[redacted]

DNA (6)(C)

[redacted]

[redacted]

DIA
DNI
(b)(1)
(a)(3)

[redacted]

Nuclear-Capable Aircraft

[redacted]

DIA
(b)(1)
(a)(3)

[redacted]

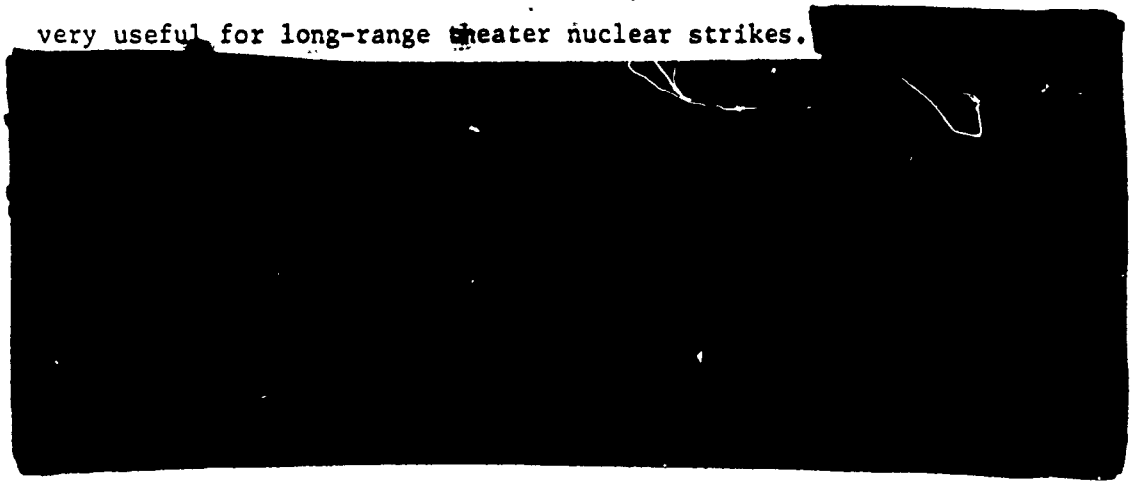
[redacted]



DIA (6)(1) (a)(3)

Needs

[redacted] these nuclear systems, Polaris and Vulcan are obsolescent. Vulcan was designed in the late 1940s and first deployed as a strategic system in 1960. The switch to a theater role and low-level penetration has increased airframe strain so that it will have to be withdrawn from service in the early 1980s. Buccaneer, first deployed on Royal Navy attack carriers in 1962, performs superbly in low-level flight. It has stood the test of time much better than the Vulcan. Originally, Vulcan and Buccaneer were both to be replaced by the Tornado, beginning in 1980.* But with a 900-km combat radius, the IDS Tornado will not be very useful for long-range theater nuclear strikes. [redacted]



DIA (6)(1) (a)(3)

[redacted] The RAF has ordered 220 IDS Tornados and 175 air defense variants. The former would replace 146 Vulcans, Canberras, and Buccaneers. The latter would replace 132 Lightnings and Phantoms.

[redacted]

[redacted]

[redacted]

The advent of a Conservative government may remove many of the political inhibitions on early debate and decision on Polaris modernization. A British decision might occur in 1980. Anglo-American negotiations on potential systems transfer could commence shortly thereafter. Thus, British SSBN/SLBM modernization decisions will coincide with NATO consideration of long-range TNF modernization.

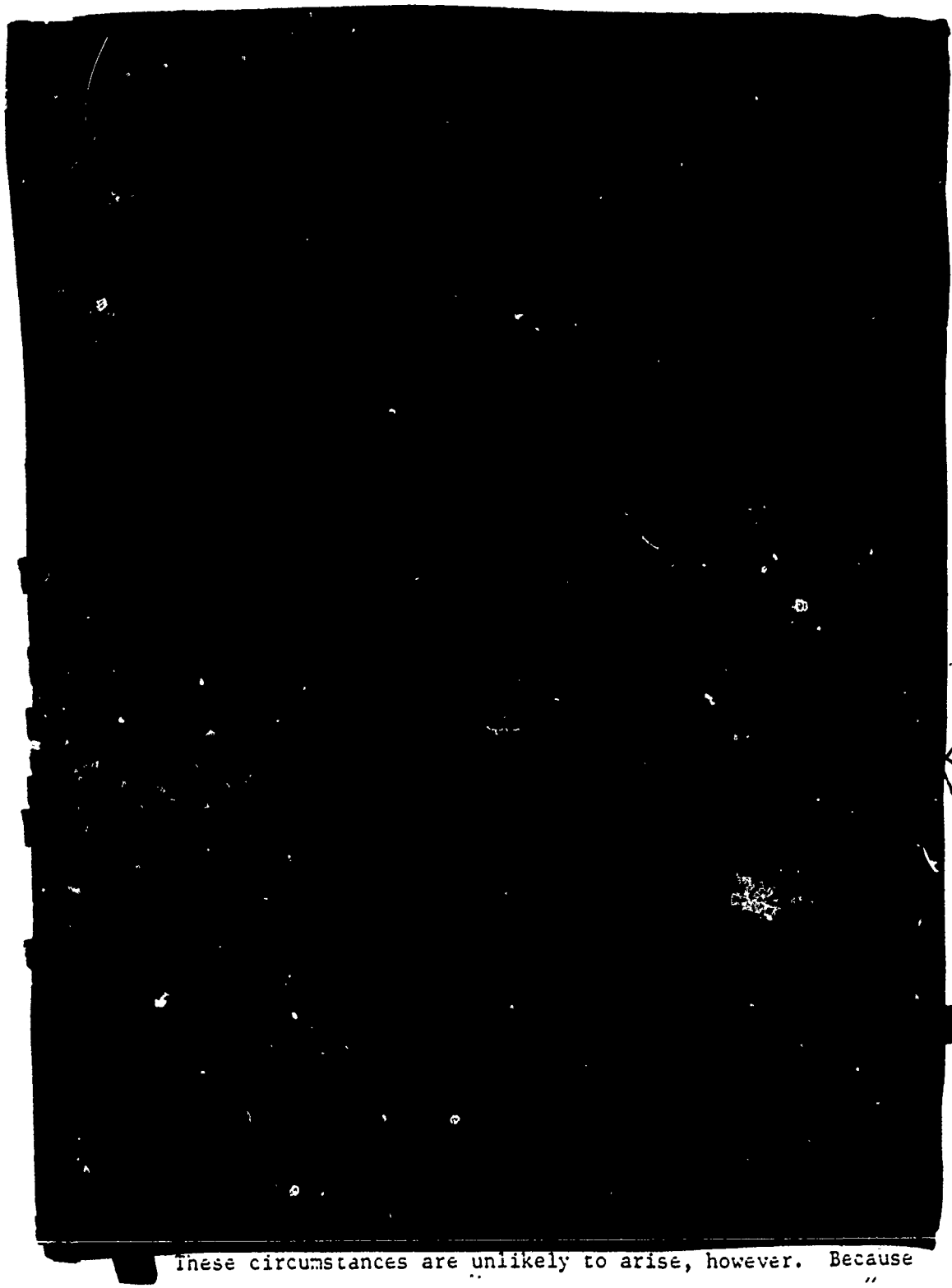
[redacted] BRITISH NUCLEAR DOCTRINE: NATO AND NATIONAL ELEMENTS

[redacted]

DIA (b)(1) (a)(3)

[redacted]

[redacted]



DIA (b)(1) (a)(2)

These circumstances are unlikely to arise, however. Because the national deterrence mission was transferred formally to the Royal Navy in 1969, Vulcan and Buccaneer are not integral to this role. The

[redacted]

existence of Polaris as an ultimate deterrent releases these aircraft for "theater" missions, whether escalatory or retaliatory, NATO or national. There is little distinction, temporal or spatial, between likely SACEUR employment conditions and probable national employment conditions. In national use, the British might employ these aircraft to (1) signal grave concern with the course of a conflict in Europe, perhaps raising escalation risks by engaging targets in the USSR, (2) conduct interdiction strikes deep in Pact territory, or (3) respond to Soviet nuclear strikes against British soil. These are essentially identical to SACEUR's missions; thus, no temporal or targeting conflict is apparent. Only if the British government were to attempt to retain a nuclear "sanctuary" status for the United Kingdom would NATO use of Vulcan or Buccaneer seem to conflict with "supreme national interests" and an incentive to withhold these aircraft emerge. While this is not impossible, it is highly improbable. Britain, in a sense, forswore "sanctuary" status in 1948 when it agreed to allow U.S. B-47s to be based in the United Kingdom. Furthermore, there would have to be a Soviet predilection to avoid nuclear strikes against the United Kingdom and a NATO desire to employ UK-based TNFs.

British interest in preserving a long-range theater nuclear strike capability after Vulcan's retirement has been inspired by or at least has paralleled NATO's interest in long-range TNF modernization. Unlike Polaris modernization, Vulcan follow-on procurement will be shaped by NATO, rather than national employment assumptions, insofar as these are distinguishable.

REQUIREMENTS FOR A FUTURE INDEPENDENT DETERRENT FORCE

Official discussion of British strategy has been muted since 1964. The political sensitivity of nuclear weapons issues within the Labor Party, which has governed for 10 of the last 15 years, is sufficient explanation for this silence. Moreover, both parties have endeavored to play down the Gaullist overtones of an "independent deterrent." Nevertheless, governments of both parties have carefully maintained the technical and operational efficacy of the Polaris force as an independent deterrent. As discussed above, quite substantial resources

[redacted]

were devoted to the Polaris Improvement Program by both Labor and Conservative governments. From these and other decisions, the elements of British national nuclear strategy and employment concepts for the future can be inferred.

[redacted] Britain's nuclear forces are meant to deter aggression by threatening to inflict unacceptable retaliatory damage upon the putative aggressor. The 1957 White Paper frankly admitted to the British public the impossibility of defense against nuclear attack, and the decision to procure Polaris provided Britain with a relatively secure second-strike retaliatory force. With a clarity students of French strategy might envy, British policy statements leave little doubt that the putative aggressor is the Soviet Union. Given the limited number and accuracy, and relatively large yield, of British weapons, Soviet cities are the likely targets. The Polaris Improvement Program aptly demonstrates the enduring significance of Moscow to British strategy.

[redacted] This retaliatory threat is clearly meant to deter widespread nuclear attacks against the British Isles. The 1957 White Paper and its immediate successors also suggested a belief that limited nuclear strikes against military targets might also be deterred. Lesser attacks clearly fell below the national nuclear threshold. For example, the growth of Soviet conventional air capabilities with the Backfire, Fencer, and Flogger in recent years has occasioned concomitant concern about the state of UK air defenses, implying that these threats must be defended against rather than deterred.

[redacted] The onset of Polaris modernization decisions will doubtless occasion debate in Britain about the means, ends, and efficacy of independent deterrence. British strategy, at least in its broad outlines, will probably remain unchanged. The resources available for modernization will be severely limited, in part by the need to maintain conventional air, sea, and land forces at something like their present levels. This need reflects genuine British threat perceptions and political/military interests. A decision to neglect conventional forces will undercut U.S. willingness to assist, as well as European support for, nuclear force modernization; conversely, a determination to maintain

[redacted]

[redacted]

and improve conventional forces may predispose the United States to offer follow-on systems on more reasonable terms.

[redacted] Implications of the Future Soviet Nuclear Threat

[redacted] When Britain last faced procurement decisions in 1962, the Soviet threat to the United Kingdom consisted primarily of relatively inaccurate SS-4/5 MR/IRBMs with multimegaton warheads. Since then the Soviets have added SLBMs, the Backfire bomber with new ASMs, and the mobile MIRVed SS-20 IRBM. As discussed in Sec. II, the latter will enable the Soviets to destroy soft military installations with reduced civilian collateral damage. For example, Table C.1 shows 40 military installations in the United Kingdom that might be considered by the Soviets as high-priority targets in a surprise nuclear attack. With one SS-20 MIRV air burst per target, the number of civilian casualties might be less than two million. (In contrast, one SS-4 RV surface burst per target would cause about ten times as many civilian casualties.) At

[redacted] Table C.1

[redacted] POSSIBLE NUCLEAR TARGETS IN THE UNITED KINGDOM

[redacted]

DASD
(NF+ACP)
(b)(1)
Sec 1.3 (a) (3)

[redacted]

issue for the future is the credibility of a threat to respond to such attacks against military targets with widespread countervalue attacks.*

[redacted] Desired Deterrent Force Characteristics

[redacted]

DIA (b)(1) (a)(3)

[redacted] General de Gaulle sought to "sanctuarize" France from nuclear war in Europe by lowering incentives for and raising the risks of Soviet strikes on French soil. Thus, expulsion of NATO bases and American nuclear storage sites accompanied French nuclear force procurement. Britain did not pursue this strand of Gallic logic. The British Left is on conceptually solid ground to link renunciation of Britain's independent nuclear forces with expulsion of U.S. nuclear-capable forces from the United Kingdom.

[redacted] Cruise missiles have sparked a great deal of interest in Britain, at least among Conservative parliamentarians.(23) Although SLCMs should be able to penetrate contemporary air defenses, as

[redacted]

[redacted]

This does not mean that the British need a hard target kill capability. As indicated in Table D.3 in Appendix D, there are many soft military installations that could be targeted. On the other hand, it is argued strongly that Britain's response to Soviet counterforce strikes should be countervalue, albeit limited, because the United Kingdom simply will not possess enough warheads to cause unacceptable damage to military installations and still retain a strategic deterrent for "ultimate" use. Moreover, Britain's demographic and geographical situation is such that regardless of weapons availability, British endurance of Soviet strikes against military targets in the United Kingdom would fall far below Soviet endurance of comparable British strikes.

Britain's ability to deter any nuclear strike depends upon the proposition that the damage Britain could ultimately inflict, while miniscule in relation to the damage threatened by the Soviet Union, is nonetheless simply unacceptable to the Soviet leadership. That proposition lies at the heart of minimal deterrence and rests, in turn, on notions of proportional deterrence. The difficulties of assessing what level or even what kind of damage might prove unacceptable to Moscow are legion. Nearly 20 years ago, Pierre Gallois articulated a notion that clearly underlay British policy, i.e., that "unacceptable damage" is a relative rather than an absolute value, that the risks Moscow will run vary with the stakes, and particularly that either superpower could endure far more damage from each other than they could accept from third powers.(24)

Although independent employment is highly unlikely, Britain's nuclear forces must be procured with an eye to such use; that is the raison d'être of the force. British officials apparently have believed that destruction of Moscow and ten other cities is unacceptable to the

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discussed in Annex 1 to Appendix D, their penetration capabilities will be much less certain than those of SLBMs. A nation with a small single-element retaliatory force would want the least uncertainty in this critical force characteristic. Since an SLBM force with a high penetration probability will probably cost less than a comparable SLCM force with an uncertain one, there is little basis, if any, for the British to procure SLCMs instead of SLBMs for their independent strategic deterrent force.

[redacted]

[redacted]

Soviet Union.* There is no way to assess the validity of this belief. As a practical matter, that level of damage will probably guide future procurement, if only because of budget constraints. Judgments about this are ultimately instinctual. All one can ask is: Assuming it was once sufficient, is it any longer sufficient?

[redacted] One line of reasoning holds that as the correlation of forces shifts in Soviet favor, damage requirements for Britain's minimum deterrence mission must rise correspondingly. However, it is not immediately apparent what the growth of Soviet military and economic power has to do with Soviet willingness to endure urban-industrial destruction. Its military power may give it greater confidence that it can fight, limit, and win a war at sub-countervalue levels. On the other hand, third power escalation to the countervalue level may actually be more threatening in the future because the Soviets will have more to lose. It could drive a conflict from a level where the Soviet Union might be able to win a great deal relatively cheaply to a level where "winning" will be uncertain and very risky. Thus, third power nuclear forces will continue to pose serious problems to the Soviet Union. And current damage requirements will probably be sufficient for the foreseeable future.

[redacted] POLARIS REPLACEMENT OPTIONS

[redacted] The range of strategic nuclear force options available to the United Kingdom in the years ahead is very limited. The overwhelming importance of prelaunch survivability to the efficacy of a small, second-strike deterrent force essentially limits the launch platform to the nuclear-powered submarine. A recently published British study argues that the submarine and SLBMs or SLCMs are the only realistic

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[redacted] The level and kind of damage that would be threatened and the characteristics to be sought in Polaris' replacement should probably reflect the existence of other nuclear threats to the Soviet Union. Britain cannot realistically presuppose that U.S. forces simply do not exist. In any imaginable situation in which nuclear weapons are employed in Europe, U.S. forces would probably be involved from the beginning. However, employment options that take this possibility into account are simply too scenario-dependent and speculative to be useful in guiding force procurement decisions.

[redacted]

[redacted]

options for British strategic force modernization.(25) These conclusions were seconded by a select, highly secret Cabinet subcommittee, which met in 1978 to examine nuclear force modernization issues. Concerned British officials also agreed that the current practice of relying, even for brief periods, on only one SSBN at sea, was very imprudent. British experience with the current SSBN force suggests that at least five submarines are needed to insure the constant presence of two SSBNs at sea.

[redacted] Four SLBMs are potentially available for British procurement: the U.S. Poseidon C-3, Trident I(C-4), and Trident II; and the French M-4. A nationally produced SLBM is another possibility. On pure cost-effectiveness grounds, U.S. SLBMs probably will be preferable. And the French M-4 might prove a cheaper option than a nationally produced SLBM. (The United Kingdom has very little experience in solid-fuel ballistic missile technology and none in SLBM manufacture.) Given this cost-effectiveness ranking, two political questions must be addressed: (1) Are these systems likely to be available for British procurement? (2) Are there political incentives of sufficient magnitude to warrant a choice on other grounds?

[redacted] Detailed discussion of the complex of interests represented in Anglo-American nuclear cooperation is beyond the scope of this appendix. However, in view of the significance of the 30-year "special relationship" between the United States and the United Kingdom in Anglo-American and U.S.-European relations, it is highly likely that the United States will continue to assist British nuclear weapons programs in the future. German observers, for example, would probably see a U.S. decision to sever this relationship as a "betrayal" of Britain and a matter of the gravest concern in NATO. Thus, it has been argued in Britain that, regardless of the ambiguities surrounding the SALT II noncircumvention clause,* SALT, if anything, increases the chances for U.S. assistance to Britain.

[redacted] Similarly, France has every incentive to make the M-4 SLBM available for British procurement, if only to permit R&D amortization over

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[redacted] A discussion of this clause is included in Annex 3 to Appendix D.

[redacted]

[redacted]

longer production runs. At this level, cooperation with Britain would be economically and politically advantageous without compromising French doctrinal independence. Some discussions of this possibility have occurred between London and Paris, which suggests that France would welcome a British procurement bid.

[redacted] Assuming the availability of U.S. systems, are there political reasons for British procurement of less-cost-effective French or national SLBMs? Many British academics and politicians would argue that Britain should demonstrate its European credentials by cooperation with the United States. On the other hand, it is argued that any political costs resulting from British procurement of American systems would be minimal and would be far outweighed by both the cost-effectiveness of such systems and the political benefits accompanying continued Anglo-American cooperation. French and German officials tend to agree with this view. They desire that Britain retain operationally independent strategic nuclear weapons, regardless of the ultimate source of British delivery vehicles. In view of these distinct economic and political incentives, Britain again is likely to procure strategic nuclear-delivery vehicles from the United States.

[redacted]

DIA (b)(1) (1)(5)

[redacted]

[redacted]

[redacted]

DNA (b)(3)

[redacted] VULCAN REPLACEMENT OPTIONS FOR LONG-RANGE THEATER NUCLEAR STRIKE CAPABILITIES

[redacted] After over 20 years in service, the RAF's Vulcan medium bombers will be withdrawn in the early 1980s. Largely as a consequence of increasing NATO interest in long-range INF modernization, the British are considering various means of retaining a capability to strike military targets in the Soviet Union from the United Kingdom after Vulcan leaves service. Of current options, cruise missiles are the most attractive.†

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† [redacted] Britain will in all likelihood decide to MIRV its new SLBMs. Both technical and political incentives underlie this assumption. Given the enormous costs of an SSBN/SLBM force, there is a natural inclination to "load up" the missile's front end as much as possible. More importantly, MIRVing provides more efficient target coverage, greater targeting flexibility, and enhanced defense penetration.

DIA (b)(1) (a)(3)

[redacted]

[redacted] The new IDS Tornado will be unable to reach the USSR from the United Kingdom without aerial refueling. As shown in Fig. D.1 and Table D.3 in Appendix D, the Pershing II MRBM with its current payload cannot reach many targets in the Western USSR. And a new medium bomber would be prohibitively expensive.

[redacted]

[redacted]

[redacted]

DIA (b)(1) (a)(3)

For some time, ALCM appeared to be Britain's preferred option. In the High Level Group, the British have stressed that long-range TNF modernization should be "evolutionary" in order to minimize possible adverse political reactions from Moscow and NATO publics. ALCMs on Tornados would be "evolutionary" because the Tornados will be nuclear-capable in any event. Each could carry 2 ALCMs. However, if the RAF is interested in retaining a dedicated theater nuclear-strike capability with the Tornado, it will seriously degrade its future conventional attack capabilities. Tornado does not appear to be cost-effective as a dedicated ALCM carrier.

[redacted]

DIA (b)(1) (a)(3)

[redacted]

[redacted]

The British are also interested in a GLCM system, even if it would be somewhat more expensive than ALCM on dedicated Buccaneers or Tornados. GLCMs can also be considered as "evolutionary," since they could be located on air bases in peacetime just like the DCA they may replace. Furthermore, they might be more survivable than ALCMs because they can be dispersed widely on warning. In any case, the British do not feel constrained in their choice by U.S. or NATO decisions. The general principle of a mix of long-range TNFs has been accepted by the High Level Group.

[redacted]

DIA (b)(1) (a)(3)

[redacted] EFFECTS OF BRITISH PROGRAMS ON NATO LONG-RANGE TNF MODERNIZATION

[redacted] NATO is currently considering the deployment of new, long-range TNFs. It is responding to a variety of political and military concerns. A main one is the deployment of the SS-20, which affords the Soviet Union more discriminating theater nuclear-strike options while reinforcing its "Eurostrategic" advantage. Moreover, NATO's tolerance for theater nuclear disparities has declined in direct relation to the advent and codification through SALT of superpower parity in central systems. The emergence of U.S. ICBM vulnerability has exacerbated allied anxiety about the implications of parity for flexible response and deterrence in Europe. Existing NATO systems are seen as either technically obsolescent or politically inappropriate for its needs. U.S. F-111s and British Vulcans are aging and their ability to penetrate air defenses and strike targets in the Soviet Union is in doubt. U.S. Poseidon SLBMs, while survivable and able to penetrate Soviet ABM defenses, appear too closely identified with U.S. central systems to be suitable for either escalatory or retaliatory theater missions. British Polaris SLBMs, similarly, are clearly a "last resort" national deterrent unlikely to be available for NATO use short of general nuclear war.

[redacted]

[redacted]

To meet these concerns, NATO's High Level Group has moved toward a decision to deploy a limited number (200 to 600) land-based systems in Europe that can reach targets in the Western USSR. Britain's direct contribution to this force will be the systems it deploys to replace its Vulcan medium bombers. Thus, Britain might provide up to one-third of NATO's new long-range TNF. The total *number* of new systems to be deployed in Europe will be large enough to provide some meaningful military capabilities but not so large as to "decouple" U.S. central systems from European defense. In this sense, force sizing will be based primarily on political considerations.

In more general terms, British nuclear force modernization will help address the enduring military and political problems that have driven and conditioned NATO's long-range TNF modernization efforts. Two fundamental issues underlie these efforts. The first is strategic: How does NATO prevent Soviet perception of an opportunity to fight, limit, and win a war at any level in Europe? This traditional NATO problem is newly complicated by the immediate prospect of Soviet superiority in virtually all forces that might be employed in a European conflict. The second issue is political: How can the FRG achieve security without "destabilizing" the politics of the Alliance? The novel aspect of this problem is that the German Chancellor evidently believes that the margin for increased German political-military prominence in Europe is now perilously small and German policy is consequently more constricted than ever. Bonn's insistence on broad Alliance participation in long-range TNF decisions and deployments is an attempt to address a distinct military threat without either increasing the FRG's military isolation or upsetting what President Giscard calls the "inner balance of Europe."

[redacted]

The Military Purposes of Long-Range TNF Modernization

[redacted]

There are essentially two military purposes for a modernized long-range TNF, nuclear deterrence and deliberate escalation.* New

[redacted]

[redacted]

[redacted]

NATO forces would enable SACEUR to respond to a wide range of threats without using U.S. central systems, the availability of which is becoming less certain in the eyes of many Europeans. This even includes the U.S. SLBMs based in Europe and committed to NATO, as discussed in Sec. II.

[redacted] It is generally believed that a "visible" land-based long-range TNF would enhance nuclear deterrence by providing NATO the capability and commitment to "respond in kind" to preemptive Soviet theater nuclear strikes. This is based on an assumption that retaliation against targets in the USSR is more likely with TNF than with U.S. central systems and that such a retaliatory threat is a more credible deterrent.

[redacted] Should the Soviet Union eschew nuclear preemption and trust in their conventional military, new long-range TNFs are thought to be more suitable for deliberate escalation for essentially the same reasons. Many Europeans believe that TNFs are more likely to be used for "signaling" than U.S. central systems, even those committed to NATO.

[redacted] NATO doctrine assumes that rational Soviet leaders will attempt, in any war, to limit conflict to some level where war is "winnable" and the attending damage to the Soviet Union is minimized. As a consequence of Soviet force modernization, NATO may only be able to deter the Soviets by manipulating the risk of countervalue warfare. Perhaps only at the countervalue level would Soviet "victory" be manifestly pyrrhic, and only when threatened with the certainty of escalation to that level would the Soviets be deterred. Independent nuclear forces in Europe provide multiple independent escalatory processes and thus could substantially enhance deterrence of war in Europe.

[redacted] The relevance of Britain's nuclear force modernization efforts to NATO's nuclear deterrence objectives derives from Britain's dual status as a contributor to NATO strategic and theater forces on the one hand and as a host for U.S. strategic and theater forces on the other. This confronts the Soviet Union with a difficult choice. If the Soviets

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DIA (b)(3) (a)(1)

[redacted]

strike against targets on the continent and in the United Kingdom, they run higher escalation risks and face a greater certainty of response. The existence of survivable British forces makes retaliation against targets in the USSR more likely than if Britain simply hosted U.S. forces. On the other hand, if the Soviets strike only against targets on the Continent, U.S. and British forces based in the United Kingdom will survive. This compels the Soviets to choose between incurring higher escalatory risks or reducing military effectiveness.



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[redacted] The Politics of Long-Range TNF Modernization

By directly contributing to NATO's long-range TNF modernization with ALCMs or GLCMs, Britain will also be helping the FRG to achieve its national security objectives without undermining Alliance cohesion. British (and French) nuclear modernization will increase the efficacy of European strategic forces as *supplementary* nuclear guarantees of the FRG and for this reason, these modernization efforts are strongly supported in Bonn. German officials appreciate the fact that multiple nuclear decisionmaking centers seriously complicate Soviet calculations. Indeed, this appreciation, or more precisely, the potential effects that a British decision *not* to modernize would have on the possibility that the FRG would develop its own nuclear force in the years ahead, has been an important argument among British officials for replacing the Polaris fleet.

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The British have also eased German concerns about the military isolation and political prominence attending a "singular" German position as a base for NATO's long-range TNFs by agreeing to accept new U.S. long-range TNFs in the United Kingdom. This is a necessary but not a sufficient condition for FRG basing of U.S. systems--Defense Minister Apel told the NATO Nuclear Planning Group that another *non-nuclear weapons state* must also accept U.S. long-range TNFs. Had the British refused to accept new U.S. systems for whatever reason, basing in Germany would have been politically impossible. Insofar as the maintenance of independent British nuclear forces is a permissive condition for U.S. bases in the United Kingdom, British nuclear force modernization directly contributes to the resolution of the political difficulties attending long-range TNF deployments by NATO.

Finally, and perhaps most important, modernization of British strategic and theater nuclear forces ensures continued British prominence in NATO and Europe as a whole. In the absence of British nuclear weapons, it is difficult to see how the Anglo-German-American trilateralism that has prevailed in NATO affairs in recent years could long endure. German "prominence" in Europe is relative to that of Britain and France. Nuclear force modernization will help Britain retain her status as a major European power and a co-equal with the FRG within NATO, at least masking the emergence of a "Bonn-Washington axis" within the Alliance. Thus, by modernizing her forces, Britain not only addresses German security needs but also minimizes the political impact of U.S. defense initiatives.

[redacted]

[redacted]

Appendix D

AN ASSESSMENT OF LONG-RANGE TNF MODERNIZATION OPTIONS

The following "requirements" for use in the selection of a new long-range TNF have evolved from recent NATO and DoD studies: prelaunch survivability (PLS), defense penetration, low cost, long range, land basing, quick reaction, and selective employment. Furthermore, it is desired that the force development be evolutionary, that its deployment and operation enable widespread Alliance participation, and that its characteristics not be constrained by SALT II. The ability of each system described in Appendix A to provide these desired capabilities is assessed in this appendix.

The purposes of this assessment are to (1) discuss the relevance of these desired force characteristics, (2) indicate which systems would not or might not have each characteristic, and (3) by a process of elimination, suggest the kinds of systems most suitable for long-range TNF modernization. No attempt is made to determine an optimal or most cost-effective system, as was done recently in the *Pershing II Cost and Operational Effectiveness Analysis*.(29)

The annexes to this appendix provide expanded discussions of defense penetration, ground-mobile system costs, and possible arms control constraints.

PRELAUNCH SURVIVABILITY

Prelaunch survivability is probably the most critical characteristic of a new system. Enough of the system must be able to survive conventional or nuclear attacks at war outbreak and thereafter for an extended period of time to provide the desired second-strike capabilities.*

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[redacted]

[redacted]

The systems described in Appendix A achieve survivability in different ways. The fixed, silo-based missiles are hardened and proliferated. However, as Soviet missile CEPs decrease and the number of RVs increase, as is expected to occur in the future, feasible levels of hardness and proliferation will not suffice. Ground- and air-mobile missiles achieve survivability by dispersal, movement, and concealment. However, it is probably not politically or economically feasible for them to operate in this mode in peacetime; thus, they will be very vulnerable to surprise, no-warning nuclear attacks on their home bases. Where ground-mobile missiles can be hardened against conventional attacks on their home bases, air-mobile missiles (on large carrier aircraft) would have to be dispersed rapidly at war outbreak to escape conventional attacks. Dual-capable aircraft will be sheltered on their MOBs when they are not on conventional missions, which is at least 75 percent of the time; however, these shelters provide no protection against nuclear attacks and only some protection against conventional attacks. Thus, many DCA could be destroyed on their MOBs in the early days of a conventional war, and all could be destroyed in nuclear attacks. Submarines achieve survivability by concealment under water. Thus, all submarine-launched missiles at sea would have a very high PLS. On the other hand, surface ships would be very vulnerable to nuclear attacks at sea as well as in port. They might survive if they are outside of the theater at war outbreak, i.e., in a port in the CONUS or at sea in the West Atlantic. The PLS of each system has been assessed in Appendix E for conventional and nuclear attacks at war outbreak and thereafter. D-days on M-day, M+3, and M+10 have been considered to reflect the effects of dispersal and mobilization before war outbreak. Table D.1 summarizes the results of these assessments for several illustrative systems.

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[redacted] Table D.1

[redacted] LONG-RANGE TNF SURVIVABILITY

[redacted]

[redacted]

DIA (b)(1) (a)(1) (a)(3)

[redacted]

(c)(2)
(1)(2)
(1)(9)
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Table D.1--continued

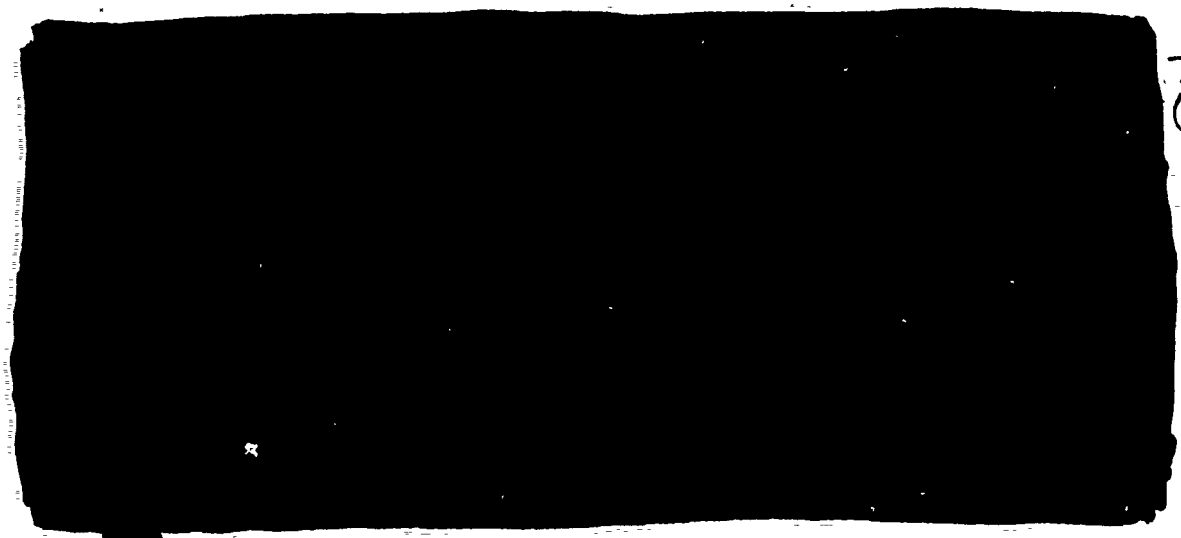
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(b)(1) Sec 1.3(a)(1)

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DASD (NF+ACP) (b)(1) Sec 1.3(a) (1)(2)

During a conventional war, attacks against surface ships, DCA, and ground- and air-mobile missiles could destroy some of these forces. Survivability over an extended period of time will depend on the outcomes of the other land, sea, and air battles that will be fought. If NATO can avoid heavy early losses and can stop Pact advances, it should be able to maintain the security of its rear, where most of these forces will be located. On the other hand, if Pact ground forces break through NATO's forward defenses and its air forces gain control of NATO airspace, extended survivability is questionable.

In summary, if high-confidence PLS is required in all contingencies and against excursion threats, submarine-launched missiles would be the only choice. If this requirement is qualified and it is assumed that some NATO mobilization and force movements would occur before war outbreak, i.e., that NATO would observe and act on the earliest indications that the Pact was preparing for war, then a ground-mobile system would also be acceptable. However, its enduring survivability after war outbreak will depend critically on its ability to remain concealed, secure, and operational in its deployment area.

[redacted] DEFENSE PENETRATION



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[redacted] This conclusion is based on a survey of the results of recent studies by DoD agencies and contractors that deal with future offensive and defensive systems and technologies. This survey is presented in Annex 1 to this appendix.

[redacted] COSTS

[redacted] Long-range TNF modernization will be a multi-billion-dollar program. Some cost estimates are included here to give a rough indication of the possible magnitude of the costs and to show how costs could vary with basing and type of missile.*

[redacted] Table D.2 gives estimates of the life cycle cost (RDT&E, procurement, and 10 years of operations and support) for 8 systems, each with 450 UE, single-weapon missiles. This force size is in the middle of the range that has been considered in recent High Level Group studies.

[redacted] Sea-Launched Cruise Missile

[redacted]

[redacted] Ground-Mobile Systems

[redacted]

[redacted] No original cost estimates have been developed in this study. The estimates included are based primarily on those in Refs. 10, 29, 30, and 31. Some adjustments have been made to remove apparent inconsistencies.

[redacted]

[redacted]

Table D.2

[redacted] LIFE CYCLE COST ESTIMATES OF LONG-RANGE TNF SYSTEMS[a]

(In billions of FY 79 dollars)

[redacted]

DIA (b)(1) (a)(1)

[redacted]

[redacted] Pershing II cost estimates appear to be the most realistic because of the Pershing Ia operational experience and the status of the program, especially in contrast to the U.S. Air Force MRBM program, which has not yet reached DSARC I.

[redacted]

[redacted]

[redacted] DASD (NF+ACP). (b)(1) Sec 1.3(a)(1)

[redacted] Fixed MRBMs

[redacted] A silo-based MRBM system is estimated to cost less than a ground-mobile system. Its operations and support costs would be lower because about half as many crewmembers would be needed. But its construction costs would be higher because of the silos.

[redacted] Air-Mobile Systems

[redacted] DIA (b)(1) (1.4)(1)

[redacted] RANGE

[redacted] All of the systems considered can reach the Western USSR from possible launch areas in Europe. Figure D.1 shows the coverage of the

[redacted] DASD (NF+ACP) (b)(1) Sec 1.3(a) (1)

[redacted] Page 111 is deleted. JS (b)(1) Sec 1.3(a)(2).

[redacted]

Western USSR possible with the 1800- and 2500-km-range missiles launched from the FRG (Ramstein Air Base) the United Kingdom (London), and 2500-km-range missiles launched from the middle of the Mediterranean and North Seas. The 1800-km-range missile coverage from the FRG and United Kingdom is that of the Pershing II. The 2500-km-range missile coverage is that of an ALCM, ASBM, GLCM, SLCM, or Air Force MRBM. Air- or sea-launched missiles provide the greatest coverage; Pershing II from the United Kingdom provides the least.



DIA (b)(1) (a)(2)

[redacted] LAND BASING

[redacted] The desire for a land-based system results more from several problems that the allies perceive with sea-based systems than from any strong advantages of land-based systems. (In fact, the allies seem willing to accept reduced survivability, greater risks of collateral damage, and higher costs to obtain a land-based system.) The problems

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[redacted] Although a 2500-km-range missile launched from the FRG can reach a large fraction of these targets, its coverage of the naval facilities in the Murmansk area appears marginal, at least from the rough drawing in Fig. D.1. Exact missile range analyses are needed to determine if these targets can be reached from the FRG with GLCMs and MRBMs. If they cannot, intercontinental forces, including ALCMs, would have to be used against these targets, or a unique requirement might exist for an SLCM.

DASD (NF+ACP) (b)(1) Sec 1.3(a) (2)

[redacted]

[redacted]

[redacted] Table D.3

[redacted] TARGET COVERAGE IN THE WESTERN USSR

[redacted]



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[redacted]

with sea-based systems deal with (1) their association with central strategic systems and general nuclear war, (2) their C^3 limitations, and (3) the high cost of a dedicated force. The main advantages of a land-based system are that it would be (1) a stronger deterrent of Soviet attacks on NATO territory, (2) more capable of selective use, and (3) a more visible "counter" to the SS-20.

[redacted] Problems with Sea-Based Systems

[redacted] NATO already has a substantial theater-based SLBM force that has adequate PLS and a large number of independently targetable weapons. However, as discussed in the body of this report, other features of this force are largely responsible for the current interest in long-range TNF modernization. Thus, the possible commitment of more SLBMs to SACEUR is not even considered. And SLCMs on SSNs are not thought to be sufficiently different to be acceptable for these and other reasons, as discussed below.

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DIA (b)(1) (a)(1)

[redacted] Finally, to assure the availability of sea-based missiles for selective use, a dedicated fleet of ships or submarines would have to be procured. This option would be prohibitively expensive.

[redacted] Advantages of Land-Based Systems

[redacted] One of the main objectives of long-range TNF modernization is to enhance the deterrence of limited nuclear attacks against military

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[redacted]

targets on NATO territory. For this, it is believed that a land-based system that can be used selectively will be a stronger deterrent than an additional increment of sea-based missiles. The land-based system would be a more evident link to the European theater and its use would thus be more credible. The relative ease of communication with a land-based system is also an important advantage.

[redacted] Another objective of long-range TNF modernization is to provide a symbolic "counter" to the SS-20. For this, it is believed that a land-based system will be better simply because the SS-20 is land based. At present, NATO has only the 18 French IRBMs to oppose the Soviet IR/MRBM force in this part of the TNF balance. A land-based missile force would substantially reduce this asymmetry.

[redacted] It is important to note that in giving more weight to these advantages of land-based systems than to the problems with sea-based systems, most of which have technical and operational solutions, the allies seem willing to forgo the least expensive option for long-range TNF modernization, i.e., SLCMs on nondedicated SSNs or surface ships. There is no fundamental reason why C^3 equipment and operational procedures cannot be designed for sea-based systems to enable them to be retargeted and used selectively in limited responses. The fact that current systems have C^3 limitations need not exist in the future with new or modified systems. As the actual and opportunity costs of land-based systems become more apparent, a reassessment of this position may be warranted. And if there is to be a mix of systems, sea-based systems certainly should not be excluded from consideration.

[redacted] QUICK REACTION

[redacted] The desire for quick reaction capabilities tends to exclude cruise missiles because of their flight times and sea-based systems because of their C^3 limitations. Once a decision to attack a target has been made, a fast-reacting system is preferred, all other things being equal. However, the difference in flight times between cruise and ballistic missiles may not be significant in most situations in which long-range TNFs might actually be used, i.e., in responses against fixed targets, when the expected delays in decisionmaking, targeting, and C^3 are taken into

[redacted]

[redacted]

account, and in attacks against movable targets when the uncertainties and delays in target acquisition are also included. And as discussed previously with respect to the advantages of land-based systems, the C^3 limitations of current sea-based systems .. not exist.

[redacted] The one situation in which quick reaction would be critical is a preemptive attack at war outbreak against targets on alert that might escape or be fired on tactical warning, e.g., aircraft and mobile missiles on bases in the USSR.* However, it seems unlikely that NATO would ever launch such an attack.

[redacted] On balance, while land-based ballistic missiles would be preferred because of their potential for quick reaction, other systems should not be excluded because their reaction times might not be as fast. Nor should the use of reload missiles with ground-mobile systems be excluded. Reusable launchers and reload missiles can provide substantial additional firepower at very low incremental costs.

[redacted] SELECTIVE EMPLOYMENT

[redacted]

DIA (b)(1) (a)(1)

[redacted] Another such situation would be during attacks against ground force units on the battlefield. It is assumed that other TNFs would be used for these attacks.

[redacted]

[redacted]

[redacted]

The desired capability for quick, effective, and efficient attacks tends to exclude cruise missiles because of their flight times and uncertain penetration probabilities, and sea-based systems because of their C^3 limitations, availability uncertainties, and attack-size inflexibility. However, as suggested before, it should be possible to deal with these limitations and uncertainties. They should not be viewed as bars to the selective employment of cruise missiles and sea-based systems.

[redacted] EVOLUTIONARY DEVELOPMENT

[redacted] The allies desire that a new system be an incremental extension of an existing system so that its development and deployment will attract as little attention as possible. This is because the allies believe that long-range TNF modernization will be a very sensitive and potentially divisive domestic political issue, especially with the Soviets pressuring their governments and arousing their publics to oppose NATO's plans for long-range TNF modernization.

[redacted] All of the long-range TNF modernization options can be considered evolutionary in some sense. Silo-based MRBMs on air bases and air-mobile/ground-launch systems would differ most from existing systems. Although both would be located on air bases like DCA, they would utilize long-range missiles as delivery vehicles instead of aircraft and have different modes of operation. Ground-mobile MRBMs and ASMs on DCA would differ least from existing systems. Pershing II is basically a longer-range version of Pershing Ia and it would be based and operated in the same way. However, the fact that it can reach the USSR where the Pershing Ia cannot is an enormous difference. *The Soviets will certainly see it that way.* ASMs would simply increase the range and weapon delivery probability of a DCA. The other systems involve a change in delivery vehicle. SLCMs on surface ships can be said to evolve from DCA on carriers, SLCMs on SSNs from SLBMs on SSBNs, and ASBMs and ALCMs on carrier aircraft from DCA with gravity bombs.

[redacted] Because *any* new nuclear system in Europe is likely to arouse great public and Soviet opposition, the desire for evolutionary development

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[redacted]

cannot be considered as realistic. Nonetheless, for political reasons it would be preferred if the new system could: (1) be located on existing military installations that have nuclear storage sites, (2) be operated in peacetime with minimal contact with the public (this is one reason why intermittent peacetime movements of ground- and air-mobile systems are not being considered), and (3) be operated by organizations that currently have similar nuclear systems. These political criteria would exclude: (a) silo-based MRBMs because none of the allies except France has an organization that operates similar systems and U.S. military installations are not large enough for the deployment of enough silos, (b) SLCMs on other than U.S. or British ships because none of the allies except France has naval nuclear capabilities, and (c) ASBM and air-mobile/ground-launch systems if the carrier aircraft cannot be based on existing MOBs.

[redacted] ALLIANCE PARTICIPATION

[redacted] As discussed in the body of this report, it is critical that the new long-range TNF not be based and operated solely in the FRG. Unanimous Alliance approval and public support for the system and wide Alliance participation in producing, maintaining, and supplying the system will not suffice.

[redacted] A member of the Alliance can participate in the basing or operation of a system in one or more of the following ways:

1. [redacted] Permit a U.S. base for the system on its territory, as exists for the U.S. Army Pershing Ia units in the FRG.
2. (U) Permit a U.S. element of the system to be located on one of its national bases, as USAFE units exist on RAF bases in the United Kingdom.
3. [redacted] Operate an element of the system under a POC wherein the United States retains control of the nuclear weapons, as exists for the German Air Force Pershing Ia units in the FRG.
4. [redacted] Agree to share a national base with a U.S. element of the system after mobilization, i.e., have one or more COBs as exist for U.S. aircraft augmentation squadrons in 8 NATO nations.

[redacted]

[redacted]

5. [redacted] Agree to share a national base with a U.S. element of the system during peacetime, i.e., have one or more forward operating locations as exist for U.S. A-10 aircraft on 3 COBs in the FRG.

6. [redacted] Agree to allow a U.S. or other national element of the system to exercise on its territory in peacetime and to deploy or disperse on its territory after mobilization. Some equipment and supplies for the system might be prepositioned on its territory to support contingency deployments.

Although this list suggests a wide variety of ways to attain Alliance participation, the actual possibilities are very limited, except if ASMs were to be added to the existing DCA.

[redacted] First of all, only one system seems to be excluded on the basis of this "requirement"--the fixed, silo-based missile. No nation seems willing to have silos on its territory, even if the system would be relatively inexpensive and possibly survivable. The image of its territory being a "sponge for Soviet RVs" and the system being "vulnerable like Minuteman" is indelible. Furthermore, the possibility of overrun by Pact ground forces would make silo locations in the FRG and BENELUX countries too risky.

[redacted]

DIA (b)(3) (a)

[redacted]

[redacted]



DIA (b)(1) (b)(3)

With an air-mobile system, rear-area deployments are necessary in both peacetime and wartime for survivability reasons. This tends to limit both basing and dispersal to the United Kingdom and Italy.

[redacted] CONSTRAINTS IN SALT II

[redacted] As discussed i Annex 3 to this appendix, the Protocol to the SALT II Treaty prohibits e deployment of long-range GLCMs, SLCMs, and ASBMs before 31 December 198. ot the development and flight testing of GLCMs and SLCMs. However, plans to deploy these systems after the Protocol expires can be expected to be strenuously opposed by the Soviets and arms control advocates. Thus, these systems may be constrained in the future by pressures to "extend" the Protocol.

[redacted] The body of the Treaty deals with long-range ALCMs and ASBMs in that any deployment by the United States would be counted in the allowable total of U.S. strategic systems and any provision of these missiles to the allies would raise questions of circumvention. Thus, the inclusion of ALCMs and ASBMs in SALT II would seem to remove them from consideration in long-range TNF modernization.

[redacted] There are no constraints on IRBMs or MRBMs in SALT II. However, NATO did include 36 Pershing Ia SRBM launchers in its MBFR Option III of 12 December 1975. The possible effects of this proposal, which has not been withdrawn, are also discussed in Annex 3.

[redacted] SUMMARY

[redacted] Table D.4 summarizes the system capability assessments presented in this appendix. For each system it indicates which desired characteristics (a) are unlikely to or cannot be met, (b) are uncertain

[redacted]

Table D.4

LONG-RANGE TNF SYSTEM CHARACTERISTICS

[redacted]

Desired Characteristic			System Capabilities[a]									
			Fixed	Ground Mobile		SLCM		Air Mobile			DCA/
			MRBM	GLCM	MRBM	Submarine	Ship	ALCM	ASBM	MRBM	ASM
Prelaunch survivability	Nuclear attacks	D = M		X	X		X	X	X	X	X
		D ≥ M[2]					X	?	?	?	X
	Conventional attacks	D = M					?				?
		D ≥ M[2]					?				?
	Endurance, given initial survival		?	?		[redacted]	?	?	?	?	?
Defense penetration				?		?	?	?			X
Low cost										X	
Range											
Land basing						X	X				
Quick reaction				?		?	?	?	?		?
Selective employment				?		?	?	?			?
Evolutionary development										?	
Alliance participation			X			?		?	?	?	
Unconstrained by SALT II				?		?	?	X	X		

[a] ? indicates that the system is uncertain to have the characteristic.
X indicates that the system is unlikely to or does not have the characteristic.
No mark indicates that the system probably has the characteristic.

[redacted]

to be met, and (c) can probably or certainly be met. *It shows that no system can satisfy all the requirements.* This means that some of the requirements should be qualified or that a mix of systems might be needed.

[redacted] One requirement that has been dropped by the High Level Group is that of PLS in the worst case of a surprise, "out of the blue" nuclear attack. This seems quite reasonable and realistic in view of the dominance of political factors in the rationale for long-range TNF modernization and the following other reasons: (1) The SLBMs at sea and other U.S. strategic forces armed with over 10,000 nuclear weapons will still survive--what difference will a few hundred more weapons make? (2) It is not economically or politically feasible to deploy a land-based system that can survive such an attack. (3) Such an attack is probably the least likely. (4) All the other requirements can be satisfied by a ground-mobile GLCM or MRBM system, which would provide the desired visible "counter" to the SS-20 at a relatively low cost. Furthermore, all the requirements can be satisfied by a mix of new ground-mobile missiles and the current Europe-based SLBM force.

[redacted] Each of the other long-range TNF options fails to satisfy one or more of the other requirements. The fixed, silo-based MRBMs would not be accepted by the allies on their territory. The SLCMs are not land-based, and if deployed on ships, could not survive nuclear attacks. The ASBM and ALCM systems would be considered as central strategic systems under SALT II unless developed and deployed independently by the allies. Air-mobile/ground-launch systems would probably be too expensive. And DCA with short-range ASMs would not survive nuclear attacks or have a high probability of penetrating future air defenses.

[redacted]

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Annex 1 to Appendix D

[redacted] DEFENSE PENETRATION

[redacted] This annex deals with some of the key issues bearing on defense penetration by future NATO long-range TNFs, which include ballistic missiles, cruise missiles, and DCA. This assessment is based on a survey of recent studies by DoD agencies and contractors that deal with weapon technology, defense penetration, and intelligence projections of Warsaw Pact capabilities in the 1985-95 time period.*

[redacted]

DIA (b)(1) (a)(1)

[redacted] None of these studies examine all aspects of a war in Europe that affect defense penetration. Nor are the study results in full accord. Divergent results are largely traceable to different assumptions about future technology, system performance, force levels, conflict type and duration, and offense-defense tactics such as barrier defense, wide-area defense, point defense, penetration aids, mixed forces, and defense suppression. While exotic or futuristic systems like high-power lasers and particle beam weapons are noted in some of the studies, they are not expected to be developed by the late 1980s.

Pages 124 through 129 inclusive are deleted.
DASD (NF + ACP) (b)(1) Sec. 1. 3(a) (1), (2).
DIA (b)(1) Sec. 1. 3(a) (1), (3)

[redacted]

[redacted]

[redacted] ABM PENETRATION

[redacted] Penetration of possible future Soviet ATBM and "strategic" or homeland ABM systems is reviewed in this subsection.

[redacted] ATBM Capabilities

[redacted]

DIA (b)(1) Sec 1.3(a)(1)

[redacted]

Pages 132 and 131 are deleted.
DASD(NF+ACP) (b)(1) Sec 1.3a(1)
DIA (b)(1) Sec 1.3(a)(1) (2)

[redacted]

Annex 2 to Appendix D

COSTS OF GROUND-MOBILE GLCM AND MRBM SYSTEMS

A simple, generic cost model of single-warhead ground-mobile MRBM and GLCM systems is developed in this annex. The model enables rough cost comparisons between these systems for a given number of missiles and common assumptions of security manning and field endurance. Differences in life cycle cost are shown to depend primarily on the number of missiles per TEL and on sunk RDT&E costs. All manning and cost data are obtained from recent contractor studies, Refs. 12, 29, 31, and 43.

MANNING AND VEHICLES

Table D.6 presents a summary of manning and vehicle estimates for Pershing II and a number of GLCM and MRBM forces. Since these systems are variants of the same generic basing mode, their manning requirements should be functionally similar. The differences are mainly due to the number of TELs and the concepts of operations, field endurance, and security. To illustrate this, total manning and manning per TEL are shown separately for security and nonsecurity functions.

Security manning ranges from 10 to 13 crewmembers per TEL for all systems. This suggests common assumptions about security manning requirements. There are also one or two security vehicles per TEL.

Nonsecurity manning ranges from 10 to 14 crewmembers per TEL for Air Force systems to about 33 crewmembers per TEL for the Army systems.*

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* Nonsecurity manning per TEL for Pershing II and GLCM (Air Force) is shown by specific function in the following table.

Function	Pershing II	GLCM (Air Force)
Missile Launch	5.7	2.0
Operations/Hq/C^3	14.2	1.3
Maintenance/Support	12.6	10.7
Total	32.5	14.0

The other Air Force Systems are the GLCM-common MRBMs and the Auto TEL MRBM designs in Refs. 11, 12, 13, and 43. They are McDonnell Douglas (MD) or General Dynamics (GD) designs.

[redacted]

[redacted]

[redacted] Table D.6

[redacted] MANNING AND VEHICLE SUMMARY FOR MOBILE MISSILE SYSTEMS

[redacted]

[redacted]

DASD (NF+ACP) (b)(1) Sec 1.3(a) (1), (2)

The number of nonsecurity vehicles ranges from 2 to 3 per TEL for Air Force systems to about 10 per TEL for Army systems. These differences exist primarily because the Army systems are designed for 30-day field endurance independent of an MOB, whereas the Air Force systems must receive support from their MOBs every 3 days.

[redacted] SYSTEM COST MODEL

[redacted] Table D.7 gives the R&D, investment, operations and support (O&S), and total life cycle cost of each system listed in Table D.6. The cost breakdowns reported in the references differ greatly in details shown and in structures used. In most cases, however, the investment and O&S costs are developed with reference to the cost of the hardware procured and the direct cost of the military personnel. Many other costs elements appear to be fixed percentages of the above two costs. For entirely new systems, i.e., those other than Pershing II, an analysis of available cost data indicates the following approximate relationships:

[redacted]

[redacted]

Table D.7

[redacted] ELEMENTS AND LIFE CYCLE COSTS OF MOBILE MISSILE SYSTEMS
(In millions of FY 79 dollars)

[redacted]

DASD (NE+ACP) (b)(1) Sec 1.3 (e) (1)

[redacted]

Investment ≈ 1.4H + 0.1M

10 years O&S ≈ 0.5H + 1.3M

where H is the direct cost of hardware (missiles, TELs, LCVs, GSE, etc.), and M is the direct cost of manning (pay and allowances). The cost of military construction and site activation would be a separate item.

[redacted] Cost of Manning

[redacted] Available data on the costs of manning (M) are presented in Table D.8. The average cost per crewmember is about $140,000 for 10 years.

[redacted] Cost of Hardware

[redacted] The rather fragmentary available data on the cost of hardware (H) are shown in Table D.9.

[redacted] Missile costs are estimated to be about $900,000 per GLCM and $700,000 per Air Force MRBM in UE quantities of 400 to 500.

[redacted]

[redacted]

Table D.8

[redacted] COST OF MANNING MOBILE MISSILE SYSTEMS

(In millions of FY 79 dollars)

[redacted]

System	Crew Size	10-Year Manning Cost, M (Cost per Crewmember)
GLCM		
GLCM (Army)	3906	540 (0.14)
MRBM		
Pershing II	3790	480 (0.13)
GLCM-Common (MD)	4234	560 (0.13)
AutoTEL (MD)	5856	830 (0.14)

[redacted] Table D.9

[redacted] COST OF HARDWARE FOR MOBILE MISSILE SYSTEMS

(In millions of FY 79 dollars)

[redacted]

[redacted]

DASD (NE+ACP) (b)(1) (b)(1)

[redacted] There is a wide variation in TEL and LCV cost estimates for the GLCM and GLCM-common systems, the reason for which is not known. Mid-range values will be assumed for this cost model--$600,000 per TEL and $2,000,000 per LCV. Other hardware and GSE costs, usually reported

[redacted]

as nonrecurring investment, will be assumed to be about 10 percent of the cost of the itemized equipment, i.e., the missiles, TELs, LCVs, and support vehicles.

Cost of Military Construction

The cost of military construction and site activation, while not defined in detail in the reference reports, is assumed to refer to the cost of MOB facilities. The available cost data are shown in Table D.10. A cost of $55 million per MOB is assumed for this cost model.

Table D.10

COST OF MILITARY CONSTRUCTION AND SITE ACTIVATION

(In millions of FY 79 dollars)

System	Number of MOBs	Total Cost (Cost per MOB)
GLCM		
GLCM (Air Force)	3	54 (18)
MRBM		
GLCM-Common (MD)	3	93 (31)
AutoTEL (MD)	3[a]	192 (64)
GLCM-Common (GD)	3	105 (35)

[a]Plus an unspecified number of mini-MOBs.

ILLUSTRATIVE SYSTEM COSTING

To illustrate the use of the cost model developed in the preceding subsection, the costs of GLCM and MRBM systems with 450 missiles deployed on 3 MOBs are estimated below. The MRBM system is an Air Force type with GLCM-common TELs, LCVs, and GSE. Both systems would be operated in the same manner.

[redacted]

[redacted] Vehicles and Manning

[redacted] Using basic system characteristics from Appendix A, the numbers of operations vehicles in each system are given in the following table:

System	TELs	LCVs	Support
GLCM	112	56	225
MRBM	150	60	300

[redacted] To operate the system with 3-day field endurance, it is assumed that 20 crewmembers per TEL would be needed. Security forces would consist of 12 crewmembers and 1 vehicle per TEL. For extended field endurance of 30 days independent of the MOB, an additional 10 crewmembers and 8 vehicles per TEL would be needed.

[redacted] Life Cycle Costs

[redacted] Given the numbers of crewmembers and vehicles (by type) for each system function, the direct hardware and manning cost elements, H and M, can be determined from the unit-cost factors derived in the preceding subsection. These costs are given in Table D.11(a). The total life cycle costs are given in Table D.11(b). They are obtained from the equation in the preceding subsection. RDT&E costs are from Table D.7.

[redacted] But for the sunk RDT&E costs in the GLCM systems, both systems would cost about the same. Of the total investment and O&S costs, about 13 percent is for security and another 13 percent is for extended field endurance.

[redacted] These life cycle system cost estimates are in fairly close agreement with those in Table D.7. With adjustments for quantity to 450 UE missiles, extended field endurance to 30 days for the MRBMs and the GLCM (Air Force), and additional security forces for the GLCM (Army), the life cycle costs of these systems are given below:

GLCM (Air Force)	$2250 million
GLCM (Army)	2460
MRBM (MD)	2760
MRBM (GD)	3280

[redacted]

[redacted]

Table D.11

[redacted] LIFE CYCLE COST ESTIMATES FOR GLCM AND MRBM SYSTEMS

(In millions of FY 79 dollars)

[redacted]

Element	GLCM	MRBM
(a) Direct Costs		
Operations:		
Hardware		
Missiles	405	315
TELs	65	90
LCVs	110	120
Support vehicles[a]	10	10
GSE	60	55
Subtotal	650	590
Manning[b]	315	420
Security:		
Hardware (Vehicles, etc.)	5	5
Manning[b]	190	250
Extended Field Endurance:		
Hardware (Vehicles, etc.)	30	40
Manning[b]	155	210
(b) Life Cycle Costs		
RDT&E	80	500
Military construction	105	105
Investment — Operations	940	870
Investment — Security	25	30
Investment — Endurance	60	75
O&S — Operations	735	840
O&S — Security	250	330
O&S — Endurance	215	290
Total	2410	3040

[a]Assumed to be $30,000 per vehicle.

[b]GLCM manning is 2240 for operations, 1340 for security, and 1120 for extended field endurance. MRBM manning is 3000 for operations, 1800 for security, and 1500 for extended field endurance.

[redacted]

[redacted]

In contrast, the life cycle cost of Pershing II with 450 missiles, 245 TELs, 82 LCVs, and additional security forces is about $4100 million. A Pershing II system is more expensive than Air Force MRBM and GLCM systems with the same field endurance and security manning because it has more TELs and LCVs and its missile weighs about 3 times as much as an Air Force MRBM and 5 times as much as a GLCM. However, the cost differences may not be as great as estimated here because the Pershing II estimates are believed to be more realistic than the others.(29) The uncertainty in Pershing II costs is estimated to be about 5 percent, whereas that of the GLCM is estimated to be about 25 percent. The Air Force MRBM costs are even more uncertain because they are based on preliminary contractor estimates.

[redacted]

[redacted]

[redacted] Annex 3 to Appendix D

[redacted] ARMS CONTROL AND TNF MODERNIZATION:
THE POTENTIAL FOR CONSTRAINTS

[redacted] As NATO faces the issue of adding long-range missile systems to its TNF, it must also face the possibility that its choices in this realm may be constrained by the positions the United States and it have taken in ongoing and past arms control negotiations with the Soviet Union and its Warsaw Pact allies. Both American and European observers, for example, have expressed fears that the Protocol to the SALT II Treaty in some way may hamper NATO's ability to deploy long-range cruise missiles. Similar fears have been expressed with reference to restrictions on Pershing II arising from the MBFR negotiations in Vienna.

[redacted] This annex examines the potential for such constraints arising out of the SALT and MBFR negotiations.* It focuses on the SALT II Treaty, the Protocol to that Treaty, and on Option III, the NATO position currently on the MBFR negotiating table. The word "potential" is important in this context, for in important cases no firm commitment limits modernization options. Rather, it is feared that constraints may emerge through the operation of political forces working to expand current commitments or stated positions. This annex thus deals not only with firm constraints embedded in the language of the agreements, but also with political factors that ultimately may affect the importance of both SALT II and MBFR in determining NATO's freedom to choose new long-range TNFs.

[redacted] A few analysts have argued that, in addition to SALT and MBFR, the ongoing Comprehensive Test Ban negotiations may produce constraints on NATO's freedom to improve or develop new warheads for theater and other nuclear systems. See, for example, p. 34 of Ref. 45 and pp. 92-117 of Ref. 46. Although these arguments are valid, they do not apply to the immediate deployment issue considered in this annex. Warheads and warhead designs exist in sufficient numbers to allow deployment of the systems presently being considered for NATO's long-range TNF, notwithstanding passage of a test ban. Future improvements on those systems, however, may be constrained by test ban limits.

[redacted]

[redacted]

SALT II

[redacted] Although the Protocol to the SALT II Treaty has been perhaps the most controversial element with regard to TNF modernization, it is the Treaty itself that explicitly constrains certain options and contains the vague noncircumvention clause that could hamper U.S. support for European initiatives for TNF modernization. This subsection will deal with the explicit prohibitions of the Treaty and its Protocol, and with the noncircumvention issue.(47)

The Treaty

[redacted] The SALT II Treaty affects two long-range TNF modernization options: ALCM and ASBM. First, *any* aircraft carrying ALCMs with ranges greater than 600 km counts as a heavy bomber under the overall limit on strategic nuclear delivery vehicles (SNDVs), and also under its subceiling on heavy bombers equipped with cruise missiles and ballistic missiles equipped with MIRVs. Second, ASBMs with ranges greater than 600 km count as SNDVs under the overall limitations, and ASBMs equipped with MIRVs fall under the subceiling on MIRVed missiles.

[redacted] In neither case does the Treaty fully prohibit such weapons. Under its terms, each signatory may have by 1982 a combined total of no more than 2250 SNDVs. Further, each may have no more than 1320 MIRVed missiles of all types, and no more than 820 MIRVed ICBMs. Within these limits each nation may mix forces as it sees fit, leaving each free to field ALCMs or ASBMs in relatively large numbers if it so desires.

[redacted] Current and projected force postures and the timing of the development process for these weapons, however, do constrain some U.S. deployment options. A medium-range ASBM would not be ready for deployment until after the Treaty expires on 31 December 1985, and at present the United States has no plans to deploy existing ICBMs in an air-launched mode. The ALCM, on the other hand, will be available in the early 1980s, but is likely to be deployed only to the extent that it does not impede existing and planned deployments of other strategic weaponry. The United States now plans to have 550 MIRVed ICBMs and 664 MIRVed SLBMs in the mid 1980s.(4) Placing the total of these two forces against the limit of 1320 on MIRVed missiles and ALCM-equipped heavy bombers suggests that just over 100 such bombers are likely to be deployed at that time.

[redacted]

[redacted]

[redacted] Thus, the Treaty itself does not directly affect the theater ASBM option, and will not unless the limits of SALT II are extended under a future SALT agreement. At present only the Protocol has an immediate effect on ASBM development, as will be described in the next subsection.

(U) Nor does the Treaty directly limit ALCMs. Although heavy bombers equipped with long-range ALCMs fall under Treaty limits, nothing in the Treaty limits the ALCM stockpile. If the CONUS-based bombers and their missile supply survive, as would most likely be the case in the event of a nuclear war in Europe, the bombers may be able to reload after theater missions. Even without reloading, a heavy bomber force of 100 B-52s, each of which would be allowed under the Treaty to carry 20 ALCMs, would be able to attack about 2000 targets. This represents about the same target coverage as achieved with the current Minuteman force. It is considerably more than that under discussion in NATO's High Level Group.

[redacted] SALT limitations on ALCM thus are less likely to influence the weapon's availability for use in the theater nuclear role than are questions relating to its military appropriateness for this role, as opposed to the strategic nuclear role. Current plans are for ALCMs to be deployed on B-52s as part of the U.S. *strategic* arsenal. Those aircraft thus will probably remain on their bases in the United States as they have in the past.

[redacted] Finally, because U.S. medium-range ASBMs or ALCMs with range greater than 600 km deployed on European-based aircraft as an element of NATO's long-range TNF would be counted as U.S. *strategic* systems in the Treaty as discussed above, these options appear to be foreclosed for long-range TNF modernization.

[redacted] <u>The Protocol</u>

[redacted] Entering into force with the ratification of the SALT II Treaty, the Protocol will expire on December 31, 1981. During this period it will affect three long-range TNF options. The flight testing and deployment of ASBMs with ranges over 600 km will be prohibited. In addition, the deployment of GLCMs and SLCMs will be limited to missiles with a range of less than 600 km. Were the Protocol to remain in force

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as long as the Treaty itself, it would impede seriously NATO's long-range TNF modernization.

[redacted] There is little doubt that the Soviets have insisted on mention of these theater systems, and especially the cruise missile, with a view of extending the Protocol restrictions. As a major U.S. option for the future, the cruise missile is a system whose deployment the Soviets have a special interest in curbing.* The Soviets have asserted in private that they fully expect the Protocol to remain in force for the life of the Treaty. And the Joint Statement of Principles that accompanies the Treaty states that future arms control negotiations will take up, among other things, issues raised in the Protocol. At the very least, then, the Soviets see the Protocol as setting part of the agenda for SALT III, in which forum they are likely to work to make permanent the Protocol's restrictions on long-range theater systems.

[redacted] Aware of Soviet interest in limiting long-range TNFs and anxious to assure its NATO allies that the Protocol should not be construed as doing so, U.S. officials have sought to make the Protocol technically distinct from the rest of the Treaty and have taken pains to separate it from the Treaty in their discussion of SALT II. The official U.S. position on the Protocol states that the United States "has preserved the option of deploying such systems in the post-Protocol period, if we decide in consultation with our NATO allies that it would be to our advantage to do so."† Further, future arms control negotiations that deal with these systems will also include comparable Soviet systems.‡

[redacted] Critics of the Protocol are less sanguine about its benign effect. Some argue that the Protocol's mere existence will slow or halt

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[redacted] Robert Legvold notes on p. 12 in Ref. 48 that while the Soviet Union "worries about the magnitude of the American [strategic effort] . . . she fears more the new twists and turns the United States will yet give the arms race. . . ." The cruise missile is such a "twist and turn."

[redacted] See p. 12 in Ref. 49 and p. 9 of Ref. 50.

[redacted] Reference 51, p. 17, notes that in consultations with NATO defense ministers, Secretary of Defense Harold Brown asserted that "Any further agreement on shorter-range nuclear systems must include the SS-22 [sic: SS-20] or the earlier SS-4s and 5s. . . ."

[redacted]

[redacted]

development work on these systems. The "mere fact that some cruise missiles are in a separate category," Henry Kissinger noted recently, "tends to inhibit their development."(52) And a still more pessimistic Senator Henry Jackson has stated his opinion that ". . . it is likely that SALT II will result in scrapping the development and eventual deployment of theater-range cruise missiles."(53) Indeed, Senator Jackson also has expressed incredulity at the idea that "following a SALT II Treaty that limits cruise missiles to 600 km, the Alliance will turn around, develop and deploy a ballistic missile fleet with substantially greater capabilities." The Protocol, in his view, will unleash forces that virtually will eliminate the Alliance's ability to modernize its long-range TNF.

[redacted] A more common and less extreme argument, one that highlights the political forces that give content to the concerns expressed by the Protocol's critics, is that the Protocol will not be easily dropped once it expires. Richard Burt has summed up these arguments and also pointed to the forces that give them content. "With cruise missiles limited by a SALT agreement (whatever its label)," Burt notes on p. 762 in Ref. 54,

> any effort to move ahead with their deployment in the 1980s will be viewed by many--in and out of government--as a retrogressive step in arms control. Thus, . . . it may be politically difficult. . . for the United States to simply plunge ahead with cruise missile deployment. This would be particularly true if, as seems likely, the Protocol expired in the midst of negotiations on a follow-on SALT III agreement; in such circumstances a U.S. cruise missile deployment would be viewed and portrayed by Moscow (as well as by many arms control supporters in the United States) as severely damaging the chances of achieving a follow-on agreement.

[redacted] NATO will not, of course, "plunge ahead" with long-range TNF deployments; it is more likely to "wade" into the issue. Before missiles can be made optional in Europe, for example, they must be developed and produced. Basing arrangements must be made. POCs must be signed by the United States and those of its NATO allies who might operate the

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new systems while the United States retains control of the nuclear warheads. And construction of sites will have to be completed, as will training of personnel to operate the systems. Some of these decisions already have been made; others will have to be made before the Protocol expires. Some will produce few political repercussions; others, because they involve large sums of money or activities that strongly suggest deployment (such as site construction), will raise the deployment issue in a way that cannot be avoided despite the fact that missiles are not actually on the ground in Europe. Though initial deployment may not occur until 1983 or 1984, political debate over the deployment issue will probably evolve slowly and with increasing urgency from now on. In fact, a minimal commitment by NATO may be needed by the winter of 1979-80 to support consideration by the U.S. Congress of appropriations aimed at funding further development of Pershing II, GLCM, and SLCM.

[redacted] It is important to note that such a debate probably would occur in any case, given the existence of opposition in and out of government to long-range TNF modernization as an issue apart from the Protocol. The Protocol itself will affect the nature and (possibly) the outcome of this debate in two ways. First, it will focus the debate on specific decisions related to specific systems; opposing deployment in Europe of GLCM or SLCM will become synonymous with "extending" the Protocol. Second and more important, it might mobilize groups opposed not to long-range TNF modernization *per se* but to "retrogressive" steps in arms control. By its very existence, the Protocol thus might expand the base of political opposition in the United States to deployment of new theater nuclear systems.

[redacted] This logic may be applied to Western Europe as well as to the United States. Although the United States may unilaterally develop new TNFs, their deployment will require Alliance decisions of some sort and at the very least decisions by the FRG to allow new long-range systems on its territory. Although many European leaders have expressed a desire to see such systems deployed, the political turmoil that surrounded their consideration of enhanced radiation weapons bears witness to the presence of strong antipathy in these nations to nuclear weapons as a class, not

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[redacted]

to mention the deployment of new long-range nuclear capabilities on their soil.* Conversely, there exists strong support in Europe for arms control agreements aimed at limiting these capabilities.† While it may prove difficult for the United States to move ahead with decisions leading to the deployment of long-range TNFs, it may be much more difficult for NATO's Western European members to acquiesce in those deployment decisions--or even to collaborate in some of them--when doing so seems to be (and is portrayed by the Soviets as) a step back from arms control.

[redacted] There are good reasons to believe that it is in Europe, rather than in the United States, that the Soviets will try to exercise greatest influence to extend the Protocol's provisions. First, public controversy over nuclear issues tends to be more heated there, and governmental policy consequently more constrained, than in the United States. Second, the Soviets have already shown a willingness to intervene directly in European consideration of nuclear issues--recall Chairman Brezhnev's open letter to Western European leaders opposing deployment of enhanced radiation weapons. Finally, over the FRG--which will unquestionably be the principal national actor in Western Europe's consideration of this issue--Soviet influence extends beyond matters of specific military and economic importance to broader issues relating to Ostpolitik and the FRG's desire for close ties with East Germany.

[redacted] Although the neutron bomb issue sparked protest in the United States, in some European countries it provoked massive public outcry. In The Netherlands, especially, more than a million people (out of a population of 14 million) signed petitions against the manufacture of neutron weapons and their deployment with NATO forces. Over 40,000 Dutch marched through Amsterdam in protest over the issue in March 1978. See Refs. 55 and 56.

[redacted] This became particularly evident during the recent Bundestag defense debate, provoked largely by remarks made by a major Social Democratic Party member, Herbert Wehner, that Soviet weapons in Eastern Europe were defensive in nature and that arms control, rather than arms deployments, should be used to create a balance in Europe. See, for example, his remarks in Ref. 57:

> It is not in line with the Federal Republic's real situation to argue for the alleged necessity of additional weapon systems and thereby incur the risk that the Federal Republic might be made the carrier of such weapons, instead of placing the weight of the alliance on the side of arms limitation and reductions.

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To be sure, urging the Protocol's extension is likely to be only part of a broader Soviet push to prevent deployment of long-range TNFs, generally. But by the time the Protocol is due to expire it should be reasonably clear on both sides of the Atlantic whether or not this broader push is taking its effect. If it is, the United States may wish to extend the Protocol in order to avoid the embarrassment of facing later rejection by its NATO allies on the deployment issue.

This raises the issue of how much mischief the Protocol's extension may raise for NATO as a whole. "I can't imagine a more divisive situation," Senator Henry Jackson asserted in 1978, "than one in which the future of arms control could be said (as the Soviets will surely say) to turn on European acquiescence in making 'temporary' limits permanant."(53) To be sure, the question of long-range TNF modernization is itself a potentially divisive issue within the Alliance, with or without the Protocol. Because the Soviets are likely to pose it as the starting point for another round of arms control talks, however, the Protocol may give the Soviets an additional means by which to forestall NATO's long-range TNF modernization, and also to create discord within the Alliance as a whole.

Another possibility, one which has received very little attention, is that the Soviets might move rapidly over the next two years to develop a long-range GLCM, SLCM, or ASBM. Many who criticize the Protocol for giving the Soviets unilateral control over the latest U.S. weapons developments would be forced to reexamine their position if by 1981 the Protocol appeared to be an instrument of bilateral control. In the extreme, the Protocol might even begin to look like a bargain for the United States and its allies. It is more likely, however, that the Soviet Union's evolving cruise missile or ASBM technology will remain inferior to U.S. technology but nonetheless might appear menacing to defense experts in both the United States and Western Europe. In this case those favoring the Protocol's extension as a means of halting new U.S. deployments or of capping a new stage in the "arms race" might find themselves allied with those anxious to extend the Protocol to halt Soviet deployments. Thus, the Protocol is more likely to be extended if it comes to be seen as having bilateral rather than unilateral effects.

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[redacted] Possible Soviet cruise missile or ASBM developments will have different effects in Europe and in the United States. A GLCM would certainly generate the most acute anxiety in Europe. Although the SS-20 and Backfire already are viewed as adding a disturbing and qualitatively different dimension to the Soviet nuclear threat to Europe, yet another element in the Soviet long-range nuclear arsenal would seem menacing indeed. Soviet SLCM and ASBM developments would probably be viewed with greater concern in the United States, although in the canonical image of general nuclear war their threats would be less than those posed by Soviet ICBMs and SLBMs. However, there are some aspects of a possible SLCM threat that could be especially serious in some scenarios, as discussed in Ref. 58. If the allies and the United States would prefer to see the Protocol extended to foreclose Soviet GLCM and SLCM deployments, respectively, the only long-range TNF modernization option left open to NATO would be the MRBM.

[redacted] To be sure, Soviet cruise missile or ASBM developments will probably not loom quite so menacingly on the horizon; critics have focused on the Protocol as a potential tool of unilateral Soviet advantage because this remains the more likely case. Thus, the Protocol's influence over the modernization issue most likely will depend on the evolving balance of forces in the debate within and among members of the Alliance concerning Soviet goals, the appropriate NATO response to improvements in the Soviet force posture, and the role of arms control in regulating superpower arms competition. Should the center of gravity of this debate shift sufficiently to allow Western governments to demonstrate the resolve to upgrade NATO's theater nuclear forces, the Protocol will become meaningless unless its extension is met with acceptable concessions from the Soviets. Should NATO's members, and especially those in Western Europe, continue to experience sharp domestic debate on these broad strategic issues, however, the Protocol indeed may become a useful tool in a broader Soviet campaign to hamper long-range TNF modernization and possibly divide the Alliance.

[redacted] Noncircumvention

[redacted] Article XII of the SALT II Treaty, the so-called "noncircumvention clause," has been criticized by those who fear that the United States

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has negotiated away the right to help its NATO allies--especially the British--modernize their own nuclear forces. Such help might involve transferring technology related to systems mentioned in the agreement--ALCM, for example. Or it might take the form of outright sales of some systems or parts of systems. Insofar as such help would be a part of NATO's overall long-range TNF modernization program, Article XII could be construed as a substantial constraint.

[redacted] The article itself is a model of vagueness:

> In order to ensure the viability and effectiveness of this Treaty, each party undertakes not to circumvent the provisions of this Treaty, through any other state or states, or in any other manner.

This vagueness has apparently been the goal of United States negotiators. In Ref. 50, Under Secretary of Defense Stanley R. Resor stated that the noncircumvention clause

> . . . is very general. It does no more than state an obligation which the United States would be under in any event. As the Secretary of Defense has recently stated, publicly, the noncircumvention clause will not affect existing patterns of collaboration and cooperation with our allies nor will it preclude cooperation in modernization. He has also stated that SALT II will not interfere with continued nuclear or conventional cooperation with our allies. There are no side deals or reservations to this position--or, for that matter, to any other.

[redacted] But vagueness can cut both ways. Wording that can be interpreted by the United States and its allies to allow former patterns of cooperation can be interpreted by the Soviets to prohibit those forms of cooperation.

[redacted] This gives the noncircumvention clause much in common with the Protocol. Neither explicitly prohibits a set of genuine options. Yet either one may become the basis for such prohibitions if political pressure in the West underwrites the view that technology transfers from the United States to some of its NATO allies indeed violates a standing arms

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[redacted]

control accord. Like the Protocol, the noncircumvention clause will constrain U.S. activities in this area only if strong political pressure arises in the United States to construe the clause in that way.

[redacted] Such a turn of events seems far less likely with respect to the noncircumvention clause than the Protocol. As Under Secretary Resor pointed out, patterns of cooperation and collaboration have existed for some time, dating in the British case from the Nassau Agreement of 1962.* In addition, both the British and the French for some time have fielded nuclear delivery systems capable of hitting the Soviet Union. Finally, these systems remain *independent* of U.S. control. The Protocol, by contrast, deals with a United States system, namely GLCM, with capabilities markedly greater than those of the land-based systems the United States has fielded in Europe in the past fifteen years.† A strict interpretation of the noncircumvention clause in a very real sense would represent a break with standard practice; extension of the Protocol would prevent such a break. Political pressure in the latter case thus may be expected to weigh much more heavily on decisionmakers than in the case of noncircumvention.

[redacted] OPTION III IN MBFR

[redacted] Option III was tabled on 12 December 1975 and remains NATO's major initiative in the MBFR negotiations. The proposal specifies reductions in two phases. In the first phase, the Soviets would remove 68,000 ground force personnel and 1700 tanks from the Warsaw Pact part of the NATO Guidelines Area (NGA), while the United States would remove 29,000 of its ground force personnel, 1000 nuclear warheads, 54 F-4 nuclear-capable aircraft, and 36 (of a total of 108) Pershing Ia SRBM launchers from its part of the NGA.‡ In the second phase, all negotiating nations

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[redacted] Some possibilities for future British nuclear force modernization are discussed in Appendix C.

[redacted] The United States deployed Thor and Jupiter IRBMs in the United Kingdom, Italy, and Turkey in the late 1950s and early 1960s. Thus, the deployment of long-range, land-based theater nuclear systems is a break from recent practice, but not an act without past precedent.

[redacted] The NGA includes East Germany, Poland, Czechoslovakia, West Germany, and the BENELUX countries.

[redacted]

[redacted]

would cooperatively reduce force levels to a collective ceiling which the West has indicated might be established at about 700,000 troops in ground forces and 900,000 in air and ground forces combined.(59)

[redacted] The proposal was tabled at a time when, from NATO's viewpoint, the most troublesome aspect of the Warsaw Pact force posture was its conventional might, and when the United States apparently felt that its tactical nuclear stockpile was, if anything, too large. In defending the initiative just after it was tabled, for example, Secretary of State Henry Kissinger stated that the United States was offering "a category of weapons of which, due to modernization, some have become dispensable. . . ."(60) From Secretary Kissinger's point of view the proposal thus had clear advantages.

[redacted] The NATO allies were less sanguine. To some, the oft-cited U.S. stockpile of 7000 warheads in Europe had acquired significance as a symbol of the U.S. nuclear commitment to the Alliance; any breach in this quantity called into question that commitment, and also foreshadowed the possibility that all U.S. nuclear warheads in Europe ultimately might be withdrawn.(61) From London, *Strategic Survey* noted that reference in MBFR to Pershing and the F-4, combined with mention of cruise missiles in SALT, but without reference to Soviet systems like the SS-X-20 (then under development) in other forum, "bred new uncertainties" about NATO's ability "to insist on a reduction of Soviet theater nuclear capabilities during the MBFR talks."(62)

[redacted] At the time the debate was academic, since the Soviets showed no serious interest in the proposal. Although the reasons for this are not clear, the Soviets probably were not anxious to trade their conventional forces in Eastern Europe for "obsolete" U.S. nuclear warheads. Indeed, the Soviets frequently had asserted their interest in launchers, not warheads, and the proposal's reference to only two types of launch vehicles may have appeared uninteresting in relation to the conventional force reductions demanded of them.(63) Equally important, the proposal said nothing of specific force levels for each NATO member and thereby failed to satisfy the Soviet Union's avowed interest in using MBFR as a means of controlling the size of the Bundeswehr.(63,64)

[redacted]

[redacted]

In the years since Option III was tabled, Soviet deployment of the SS-20 and the Backfire has given NATO an additional cause for concern over the proposal's contents. The Pershing II is a leading contender for at least one element of a modern long-range TNF, in some part because its status as an evolutionary advance over the already deployed Pershing Ia is thought to make it politically more acceptable to the FRG.(65) But by the terms of Option III, Pershing deployments would be held to 72 launchers. And if the missile were somehow renamed or reclassified to take it out from under the proposal's "Pershing" constraint, it also would lose its "evolutionary" status and the perceived ease with which it can be introduced.* If Option III were to become the basis for an MBFR accord, it thus would constrain--or at least impede--NATO's freedom to deploy this element of modernized long-range TNF.

Not surprisingly, increasing concern within the Alliance over the SS-20, the Backfire, and NATO's need to respond to their deployment has sparked some debate about the wisdom of leaving Option III on the table in its original form. Although few critics see any problem with reducing the U.S. weapon stockpile by 1000, all agree that because it limits Pershing deployments, Option III (in its entirety) should be withdrawn from the MBFR negotiating table. These critics echo critics of the Protocol to SALT II in fearing that strong political and bureaucratic forces may prevent the United States from acting in what they perceive to be its own best interest; an arms control initiative once tabled should not acquire a life of its own.

Were the Soviets to express an interest in Option III or incorporate its terms in a counterproposal, NATO would still be able to deploy 72 Pershing II launchers, a quantity sufficient to satisfy NATO's High Level Group, perhaps, if deployed in a mixed force with GLCMs or

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* The "evolutionary" nature of Pershing II may be illusory, regardless of its name and operational similarity to Pershing Ia. The Soviets are certain to distinguish between an SRBM that cannot reach its homeland and an MRBM that can strike targets hundreds of kilometers into the Western USSR.

[redacted]

[redacted]

SLCMs.* At least one critic of Option III has suggested, however, that its reference to Pershing "raises the possibility, perhaps the probability, that an improvement of Pershing. . . or indeed any innovations in NATO theatre nuclear weapons, might be branded as a circumvention."(45) Alternatively, extension of the Protocol's restrictions on other kinds of long-range theater nuclear systems might make the deployment of 72 Pershing II launchers not worth the cost.†

[redacted] It is unlikely, however, that Option III will have such extreme effects. Indeed, in all likelihood the proposal portends fewer constraints on NATO's theater nuclear force posture options than the SALT II Protocol. The Protocol, after all, is part of a major--indeed the major--United States-Soviet arms control agreement to date; Option III has yet to be considered seriously. And while an extended Protocol would eliminate a wide range of theater nuclear force options, an MBFR agreement based on Option III would place what amounts (in the absence of an extended Protocol) to nominal constraints on one system, the Pershing II. The Protocol thus has more potential for constraining long-range TNF modernization than has Option III.

[redacted] UNITED STATES ARMS CONTROL AND EUROPEAN POLITICS

[redacted] Uwe Nerlich has suggested another way in which U.S. arms control initiatives indirectly may impede NATO's plans for long-range TNF modernization. On pp. 8-9 of Ref. 67 he notes that

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[redacted] In the past few months the Soviets have expressed renewed interest in MBFR, and have advanced proposals of their own to Bonn, London, and Washington individually.(66) It is not clear whether the Soviet proposals take off from Option III or are meant to be entirely independent of it, but it seems clear that once SALT II is concluded the Soviets will try to conclude an MBFR accord. In this case Option III, which has been virtually a dead issue since it was tabled late in 1975, may become an important concern once again.

[redacted] Pershing II seems to enjoy much of its popularity as a long-range TNF modernization option because of its "evolutionary" nature. Thus, some believe that only enough of these systems need be fielded to "break ground" for more cost-effective systems. If this is the case, then 72 Pershing II launchers, supplemented by an equal number of reload missiles and a force of GLCMs or SLCMs, might be sufficient to serve the intended purpose.

[redacted] Some reasons why Pershing II does not appear cost-effective in comparison with GLCM and an Air Force MRBM are discussed in Annex 2 of this appendix.

[redacted]

[redacted]

Any West European TNF-related initiative would tend to require some American retreat from established arms control positions.. This, in turn, means that embattled West European governments have to leave domestic trenches in order to pull their battalions together in favor of certain TNF improvement measures. Yet they have to do this in view of a distinct possibility that, notwithstanding the status of Alliance consultations, the U.S. Administration will dismiss those measures eventually.

[redacted] Currently faced with domestic opposition to deployment of long-range TNFs, NATO's European leaders must go into political battle knowing that the resolve of their major ally, the United States, is likely to be weakened by a lingering commitment to arms control initiatives that include limits on these systems. This means that it will be more difficult to bring Right and Center together behind long-range TNF modernization. Moreover, The Soviets can be expected to try to take advantage of the limited but nonetheless real leverage these initiatives provide as part of their broader drive to prevent modernization by strengthening the opposition from left wing elements within West European politics.

[redacted] This point must be kept in perspective. With or without the Protocol and Option III, long-range TNF modernization would remain a matter of considerable debate within and among members of the Alliance, just as it would remain the focus of Soviet interest and avowed antipathy. The existence of two arms control initiatives that as yet wield no explicit technical force over the modernization issue thus may exacerbate, but hardly creates, a sense of foreboding among NATO's European leaders as they wait for the United States to resolve its own doubts and uncertainties about the need for long-range TNFs. Conversely, should the United States demonstrate resolve in other areas of its relationships with both its NATO allies and the Soviet Union, the already limited effect of these two initiatives on West Europe's sense of U.S. commitment to long-range TNF modernization may be contained still further. The Protocol and Option III, in other words, are but small threads in the fabric of Alliance politics as they pertain to this issue.

[redacted]

[redacted]

CONCLUSION

[redacted] A search for explicit constraints on NATO's long-range TNF modernization options has revealed that none of real consequence exist as a part of a formally sanctioned arms control accord. If U.S. arms control initiatives are to constrain these options, they will do so by virtue of their political effects in the United States and, perhaps more importantly, in Europe. In the extreme, the SALT II Protocol and MBFR Option III could operate jointly to frustrate the deployment of *any* long-range TNF, while at the same time they might provoke an intense debate among Alliance members that might strain NATO's solidarity. They will do so, however, only to the extent that they crystalize political support in Europe and the United States in a way that hamstrings continued development work on or deployment of the systems mentioned in each initiative. Should such support crystalize at different rates in Europe and the United States, either initiative could become the focus of Alliance debate.

[redacted] These possibilities rest on the assumption that significant political support for arms control will continue to exist in the West over at least the next five years. The palpable growth of Soviet strategic forces that has occurred over the past decade has not gone unnoticed in the United States, however; indeed it has precipitated some strong opposition to the SALT II Agreement in the U.S. Senate. Barring a marked change in Soviet patterns of developing and deploying nuclear weapons, arms control may garner less political support in the future relative to arms developments. The fears currently expressed about the influence that the Protocol and Option III may have in the United States thus may gradually subside.

[redacted] This is not to say that arms control will lose support entirely or that it will cease to play an important role in the making of U.S. national security policy. It is rather to say that a view of arms control as an alternative to arms competition--a view very popular in the wake of SALT I but increasingly less tenable in the years since--is likely to give way to a view of arms control as one way of trying to *manage* competition in arms. Arms control will be viewed less as an end in itself than as a tool or means of conducting national security policy.

[redacted]

[redacted]

[redacted] To the extent that the United States achieves a solid consensus behind long-range TNF modernization, it will become easier for concerned European leaders to take a firm stand in support of new deployments. Still, the division between those favoring arms control and those favoring deployments generally has been deeper in European polities than in the United States, especially on nuclear issues, and will probably remain so regardless of changes in the Soviet force posture.* Thus, opposition to the deployment of new TNFs, as well as support for arms control, will probably remain stronger in Europe than in the United States. Political forces underwriting the extension of the Protocol or the continued viability of Option III will probably continue to operate in the FRG, Belgium, and The Netherlands--the key nations so far as long-range TNF deployments are concerned--even as they abate in the United States. For this reason, the Soviets are likely to direct most of their efforts to impede TNF modernization to European audiences.

[redacted] This makes it all the more important for United States policymakers to make sure that the case for long-range TNF modernization is a compelling one and to exercise great care in devising a political strategy for winning support for the systems among its NATO allies. In any case, long-range TNF modernization will be a potentially divisive issue within the Alliance, especially between the United States and Western European members. The existence of the Protocol, and to a lesser extent Option III, simply makes the issue that much more deserving of delicate treatment.

[redacted] It has been observed that although the left wing of the Social Democratic Party in West Germany remains opposed to TNF modernization, it is considerably more realistic in its approach to national security issues now than it was five or ten years ago, a result of watching Soviet strategic and theater forces grow during that period. Although this does not invalidate the point made here, it does indicate the importance of Soviet activities in shaping debate in Europe about the utility of TNF modernization.

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Appendix E
PRELAUNCH SURVIVABILITY

[redacted] The PLS of the missiles in each basing option described in Appendix A is assessed in this appendix for nuclear and conventional attacks at war outbreak and during the early days of a war. Zero, 3, and 10 days of NATO mobilization and alert before D-day are considered. Detailed analyses of the PLS of silo-based MRBMs to nuclear attacks and DCA to conventional attacks are presented in the annexes.

[redacted] FIXED

[redacted] The missiles are assumed to be located in 21-MPa silos on NATO military installations. In the illustrative deployment considered, there are 10 silos on an air base. The silos would be about 750 m apart.

[redacted] Nuclear Attacks

[redacted] Figure E.1 shows missile PLS as a function of CEP, yield, and number of RVs attacking each silo.

[redacted]

DIA (6)(1) (a)(2)

[redacted]

DIA (6)(1) (a)(3)

[redacted]

Pages 160 and 161 are deleted. DIA (b)(1) Sec 1.3(a)(1)

[redacted]

[redacted]

DASD (DF+ACP) (b)(1) Sec 1.3(a)(1), (2)

[redacted] Conventional Attacks

[redacted] The hardened silos should be able to withstand direct hits by most conventional air-to-ground munitions. If this is not possible the chances of direct hits can be reduced to low levels by various active and passive defenses. Air bases will have AAA and/or SAM systems, which at least should significantly inhibit the use of precision-guided munitions (PGMs). Other possible countermeasures include smoke, jammers, camouflage, and decoys.

[redacted] Postattack Endurance

[redacted] The period after a nuclear attack will be the most difficult for enduring survival because none of the personnel and facilities on the air bases can be expected to survive, and direct access to the missile may be impossible for many days. Thus the surviving missiles must remain operational on their own, and external C^3 links must exist.

[redacted] A different problem for those missiles located on the Continent is the possibility that they might be overrun by the Pact's ground and airborne forces that would be used to exploit the damage and disruption caused by the Pact's initial nuclear attacks. These forces are much better prepared for combat in a nuclear environment than are NATO's forces. This suggests that NATO might quickly be faced with a "launch or lose" decision for these missiles.

[redacted] Analyses of these threat excursions and other aspects of system survivability are presented in Annex 1 to this appendix.

[redacted]

[redacted]

[redacted] GROUND MOBILE

[redacted] In peacetime, the missiles, TELs, and LCVs would be located in shelters or open parking areas on MOBs. Other vehicles, maintenance and support equipment, reload missiles, supplies, etc., would also be on the MOBs. Some missiles may be on QRA on the MOBs or at separate sites. On command during a crisis, the firing units and other mobile elements would disperse to covert field positions. These moves would be completed in less than 48 hours.

[redacted] Nuclear Attacks

[redacted] In the case of a nuclear attack before the system has time to disperse (D-day is M-day), all elements of the system could be destroyed on the MOBs.(69) The shelters for the missiles would not be hardened against nuclear effects.

[redacted] Given 3 days of dispersal and field movement before D-day, the Pact may be able to attack and destroy only a small fraction of the firing units at war outbreak. This conclusion is based on an assumption that it will be very difficult for the Pact to locate and track the firing units accurately during the early days of NATO mobilization.* Those that disperse by road could be a few hundred kilometers from their MOBs. And those that are dispersed initially by air could be many kilometers from the deployment airfield. However, a unit in the field will be very vulnerable to a nuclear missile or aircraft attack if it can be located within a few thousand feet. If aircraft are used, visual target acquisition would not be needed for weapon delivery.

[redacted] Conventional Attacks

[redacted] In the case of a conventional attack on the MOBs before the system can disperse, PLS can be high if hardened shelters are provided

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[redacted] The results of studies, analyses, and exercises suggest that a high PLS should be possible if system operations include (a) C^3 discipline, (b) concealment and deception, (c) frequent nighttime movements, (d) equipment dormancy, (e) secure firing positions and movement routes, and (f) various other security and counterintelligence measures. However, there will always be a great deal of uncertainty as to the effectiveness of these measures. See Refs. 29, 44, and 70-74.

[redacted]

[redacted]

and very low otherwise.* The shelters can be designed to withstand direct hits by most conventional air-to-ground munitions. As discussed for the silos, the chances of direct hits can be reduced to low levels by various active and passive defenses. Such defenses can also be employed to protect the personnel, vehicles, and equipment that might not be sheltered.

[redacted] As discussed for nuclear attacks at war outbreak, it should be very difficult for the Pact to locate and track the firing units in the field during the early days of NATO mobilization. However, unlike the nuclear case, those units that are located may be difficult to destroy because precise location and weapon delivery is necessary for effective attacks with conventional munitions. For air attacks, visual target acquisition may also be necessary. This will be especially difficult when the firing positions are in wooded areas. Visual target acquisition will not be necessary if radio beacons can be placed near the firing positions for offset bombing. However, aside from the problems of emplacing the beacons, it does not appear that the resulting accuracy will be good enough for effective conventional air attacks. Thus, the PLS of firing units and other system elements in the field should be high.

[redacted] Postattack Endurance

If the system's maintenance, support, and supply elements disperse to the field along with the firing units, enduring survival should be possible with the same set of measures used to gain a high PLS at war outbreak. Concealment, C^3 discipline, equipment dormancy, and perhaps less frequent movements will help prevent location and targeting. But larger security forces may be needed to protect the units against attacks by enemy agents and units operating in the rear area. (It is known that mobile missile forces are a high-priority target of such units.) Enduring

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[redacted] The system variant that includes an initial air movement should have a somewhat greater PLS because the Pact will not know in advance the location of the remote operating areas.

[redacted]

DASD (NF+ACP) (b)(1) Sec 1.3 (a) (1) (Z)

[redacted]

[redacted]

survival will be especially difficult for units on the Continent to achieve in a nuclear environment, when the Pact's ground forces may be able to break through NATO's lines. However, as with the PLS of the dispersed units at war outbreak, there is a great deal of uncertainty about the threats and the various defenses against them.

[redacted] If the system's maintenance, support, and supply elements do not disperse to the field, enduring survival will be more difficult. In the case of nuclear attacks on the MOBs at war outbreak, these elements would be destroyed and the operational readiness of the firing units in the field would degrade thereafter. In the case of conventional attacks on the MOBs at war outbreak, survivability of these elements will depend on their location on the MOB and the effectiveness of their defenses. Their survivability will be high if they are in hardened shelters. It will be low if they are in soft buildings located near other targets on the MOB, e.g., aircraft parking and shelter areas.

[redacted] Enduring survival from all threats should be much higher for missiles based on the United Kingdom than for those based on the Continent.

[redacted] AIR MOBILE/GROUND LAUNCH

[redacted] In peacetime, the missile , ELs, transport aircraft, and support elements would be located on MOBs. Shelters for the aircraft and missiles will not be needed unless the Pact develops a large cluster bomb unit (CBU) payload for some of its ballistic missiles, as will be discussed below. Some missiles might be on QRA and some might be loaded on their aircraft for quick takeoff and dispersal on warning. On command in a crisis, all the missiles and ELs would be loaded on the aircraft and flown to dispersal airfields.

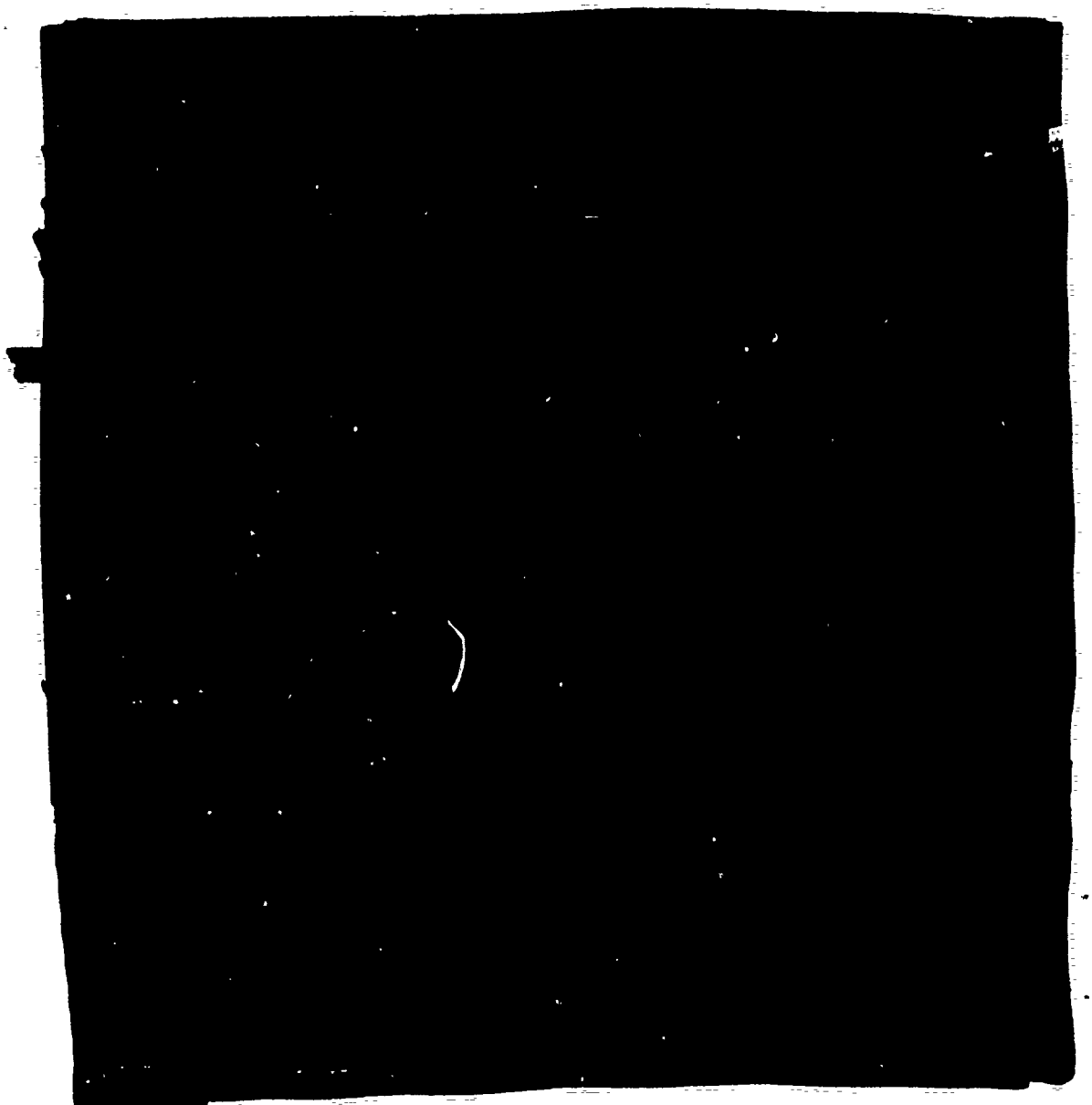
[redacted] Nuclear Attacks

[redacted]

DIA (b)(1) (a)(1)

[redacted]

[redacted]



DZA (b)(1) @(1),(b)(3)

[redacted] Without reliable information on aircraft locations, the Pact might attack *all* the airfields on which the aircraft and missiles might be located. It will certainly have enough nuclear weapons to attack a few hundred airfields in addition to all the other targets that it

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[redacted] There will probably also be a much larger number of tactical airlift aircraft of the same type in Europe. But they would operate from a relatively small number of airfields in the countries to which the missile-carrying aircraft would disperse. If it is thought that the missile-carrying aircraft might also use these airfields, the discrimination problems could be avoided simply by including these airfields in the initial nuclear attack.

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might attack at the start of a nuclear war. But will it know all the airfields that *might* be used? And if it did, would it employ such a brute-force targeting option? Again, PLS is difficult to assess.

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DIA (b)(3) (a)(1)

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Conventional Attacks

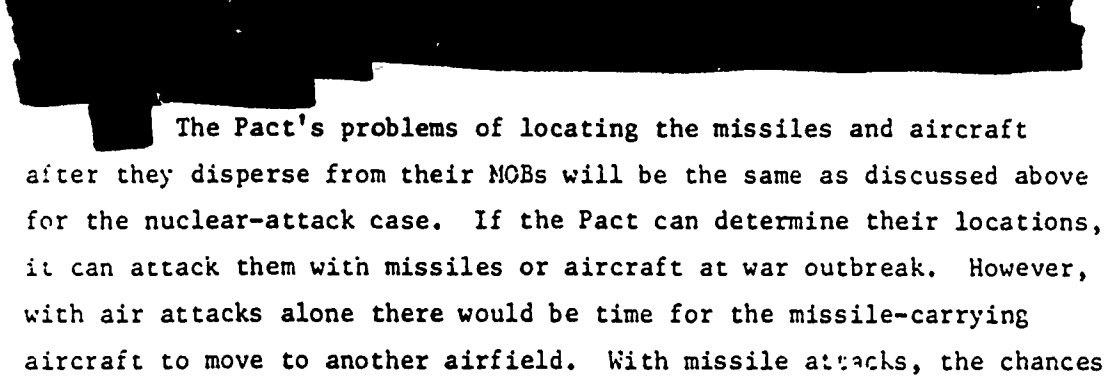
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DIA (b)(1) (a)(1)(B)

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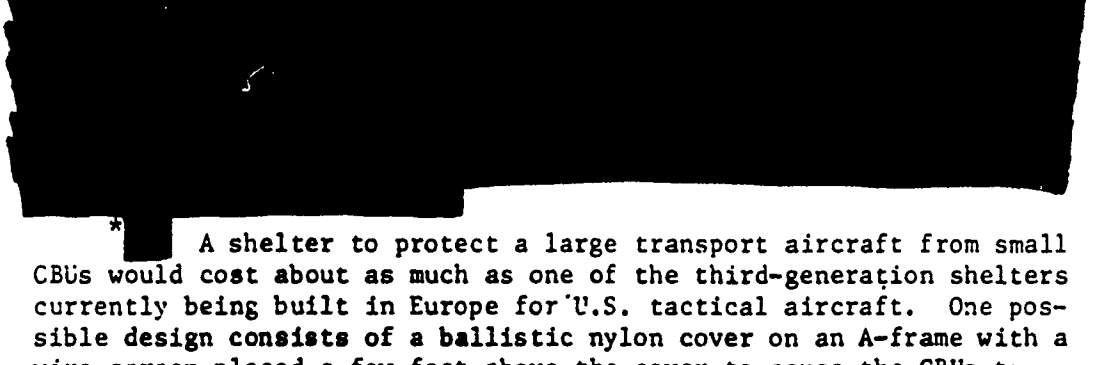
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DIA (b)(1) (a)(1)

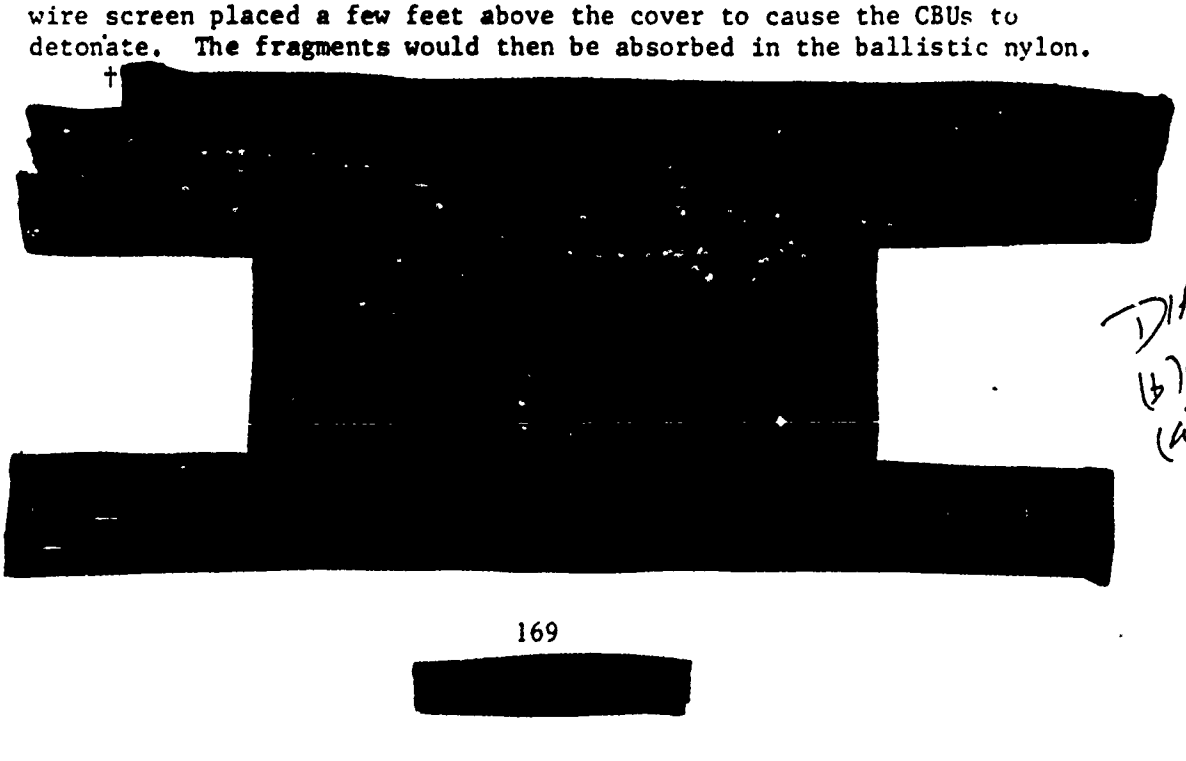
The Pact's problems of locating the missiles and aircraft after they disperse from their MOBs will be the same as discussed above for the nuclear-attack case. If the Pact can determine their locations, it can attack them with missiles or aircraft at war outbreak. However, with air attacks alone there would be time for the missile-carrying aircraft to move to another airfield. With missile attacks, the chances of damaging unsheltered carrier aircraft are large but the missiles and their C^3 and launch equipment would probably survive.† Follow-on fighter



DIA (b)(1) (a)(1)

*A shelter to protect a large transport aircraft from small CBUs would cost about as much as one of the third-generation shelters currently being built in Europe for U.S. tactical aircraft. One possible design consists of a ballistic nylon cover on an A-frame with a wire screen placed a few feet above the cover to cause the CBUs to detonate. The fragments would then be absorbed in the ballistic nylon.

†[redacted]

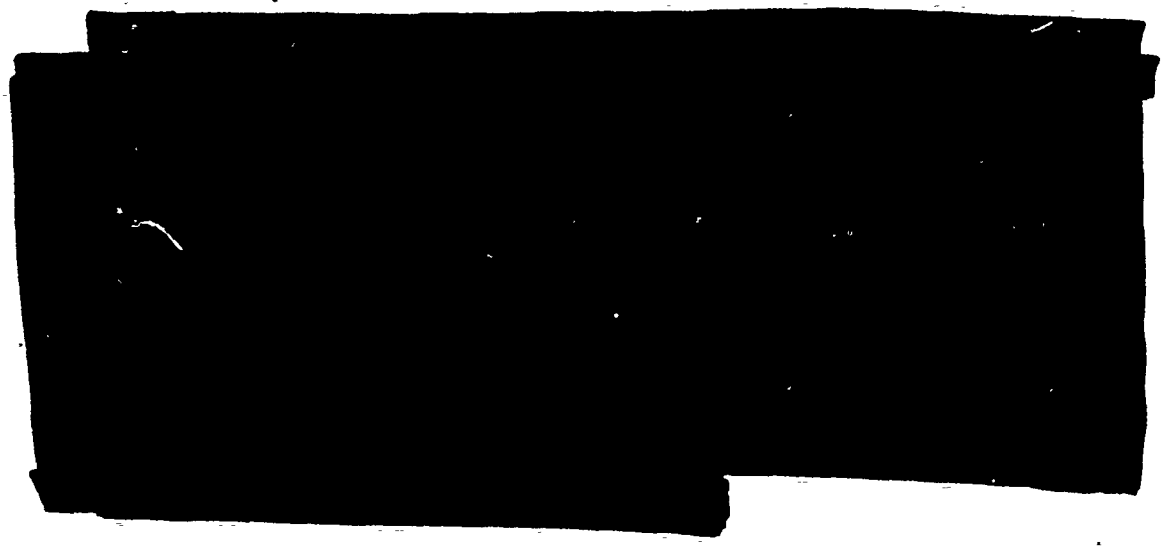


DIA (b)(1) (a)(1)

[redacted]

[redacted]

attacks could then destroy the damaged aircraft and their missiles, since hardened shelters for the missiles would probably not be available at the dispersal airfields.



DIA (b)(1) (a)(1)

[redacted] Postattack Endurance

As discussed above, PLS could be low when the war starts with nuclear attacks, even if the missiles and aircraft are dispersed. Enduring survival of those missiles and aircraft that survive in Europe on D-day or are deployed from the CONUS after D-day will depend critically on whether enough of the system's maintenance, support, and supply elements also survive. Those elements at the MOBs could be dispersed along with the aircraft and missiles or additional elements could be brought from the CONUS. Postattack survival will then depend on keeping the Pact from knowing the location of the surviving aircraft, missiles, and support elements. In any case, aircraft operations in a nuclear environment will be very difficult.

[redacted] Enduring survival during a conventional war will also require a survivable logistics system. Elements on the MOBs should be located in hardened shelters to enable them to survive surprise conventional air attacks. But they should be dispersed thereafter with the surviving aircraft so that they would not be vulnerable to a possible nuclear attack on the MOB. The extent to which the system will be subjected to follow-on conventional air attacks will depend on (a) the survival and effectiveness of NATO's air defenses, (b) NATO's capabilities for attacking Pact air bases to destroy aircraft on the ground and

[redacted]

[redacted]

reduce sortie rates, and (c) the Pact's capabilities to locate the dispersed aircraft and missiles. Because of the great uncertainties in these factors, enduring survival during a conventional war is very difficult to assess.

[redacted] If war outbreak occurs before the CONUS-based elements of the system have been moved to Europe, decisions regarding the deployment of those elements should be based on the prospects for survival in Europe. In other words, those elements should not be deployed unless they could survive in Europe or unless they would be used soon after their arrival in Europe.

[redacted] AIR MOBILE/AIR LAUNCH

The operational and PLS considerations for this system are basically the same as those for the air-mobile/ground-launch system. The only difference is that a small fraction of the missile-carrying aircraft might be kept airborne after simple alert and war outbreak. (Airborne alert operations during peacetime would be very expensive. Also, they are not considered to be politically feasible.) Airborne aircraft should be able to survive at war outbreak if the Warsaw Pact is unable to track them in the air.

[redacted] LAND-BASED DUAL-CAPABLE AIRCRAFT

[redacted]

Nuclear Attacks

[redacted]

DIA (b)(1) (a)(4)

[redacted]

[redacted]

[redacted]

Conventional Attacks

[redacted]

DIA (b)(1) (a)(3)

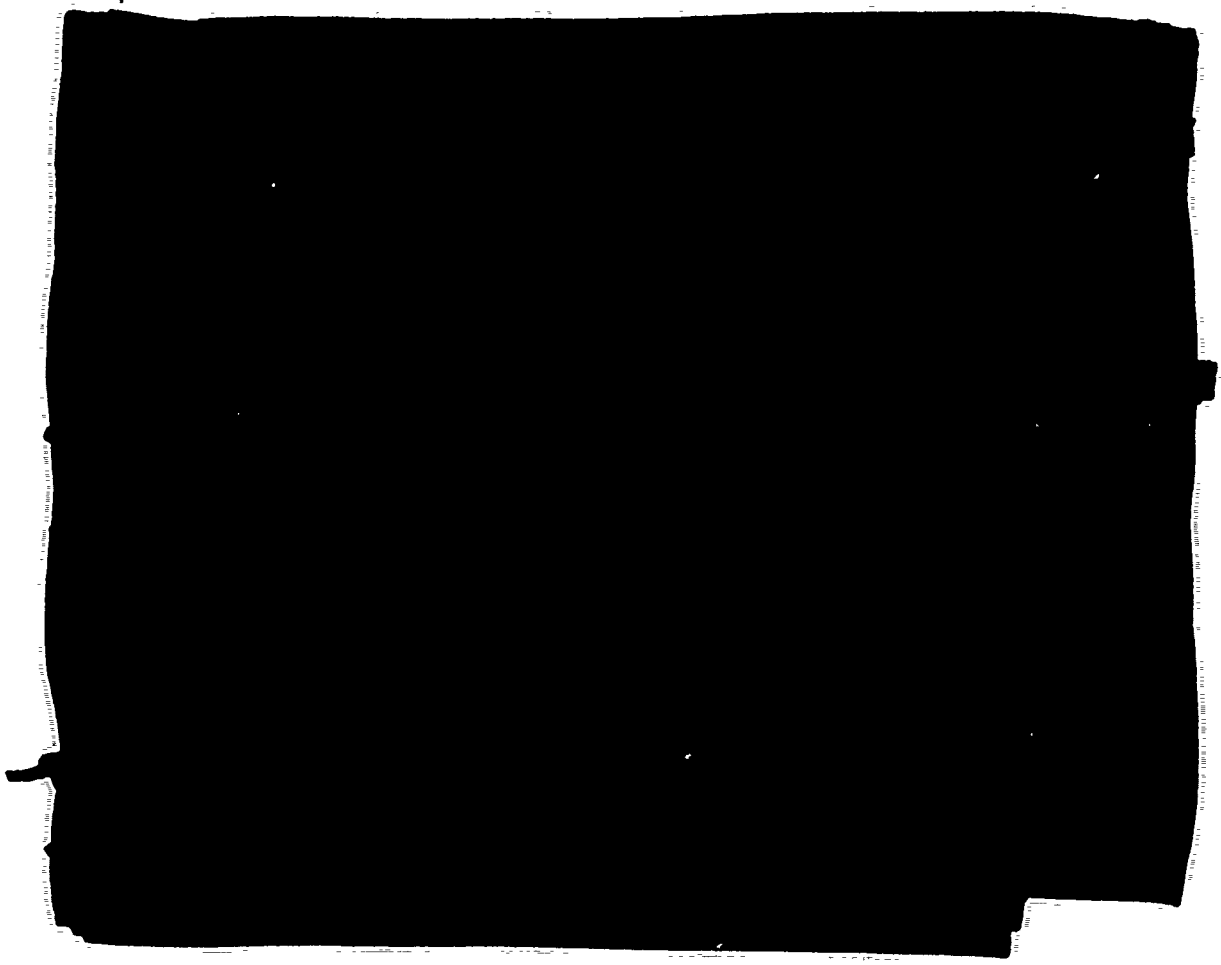
[redacted] Prelaunch survivability can be increased by airborne alert,(80) strip alert with crews in cockpits,(29) and dispersal to highway landing strips and other airfields.(81) These measures are not considered here for the following reasons. Airborne alert will probably be precluded because of the need to use most of the DCA for conventional operations. All of a wing's aircraft and crews would need to be withheld just to keep 20 to 30 percent of the aircraft airborne. Furthermore, airborne alert operations during peacetime will be very expensive and are probably politically infeasible. For strip alert, the number of aircraft that might escape on tactical warning would be small. But more importantly, it is unlikely that accurate, reliable, and timely tactical warning based on missile-launch detection would be available. And for dispersal to other landing strips and airfields, the logistics, security, and C^3 problems and the unavailability of the aircraft for conventional operations seem to outweigh the chances that a few DCA might survive. Finally, measures taken during a conventional war that indicate to the Pact that the DCA are being prepared for nuclear strikes would support the Pact's incentives to launch preemptive nuclear strikes.

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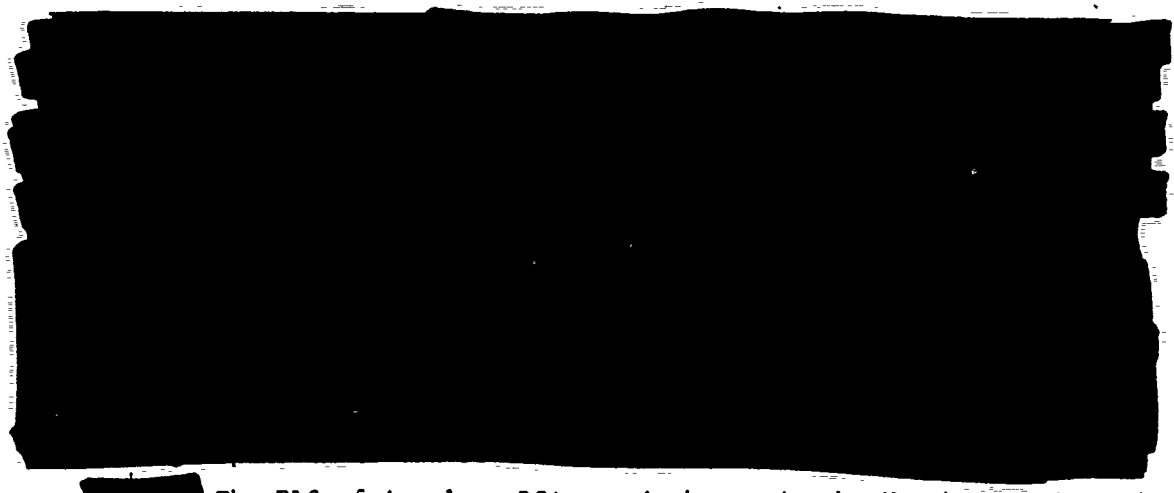
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DIA (b)(1)
Sec 1.3 (a) (1) + (3)

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DIA (b)(1) (a)(5)



DIA (b)(1) (a)(1)

[redacted] The PLS of in-place DCA on air bases in the Northern and Southern Regions has not been assessed, nor has that of any U.S. augmentation DCA or French DCA. If these other DCA are sheltered like those on the 15 MOBs considered, their PLS should be about the same. No attempt has been made to reflect the projected status of the shelter construction program at a particular year in the late 1980s. In fact, some DCA still may not be sheltered by this time. Their PLS would be much lower.

[redacted]

[redacted]

[redacted] Postattack Endurance

Any land-based DCA that might survive nuclear attacks at war outbreak would have essentially no postattack endurance because their MOBs and dispersal bases would be destroyed. Moreover, most of the support personnel would not have survived. If the nuclear attacks occur before all the U.S. augmentation DCA are deployed from the CONUS, those DCA remaining in the CONUS would be essentially useless because there would not be any air bases or personnel in Europe to support them.

[redacted]

DIA (b)(1) (a)(1)

[redacted] NAVAL FORCES*

Current long-range naval nuclear forces include U.S., British, and French SSBNs, and U.S. and French carriers with DCA. A projection

---

[redacted] No original analyses have been carried out for the survivability assessments presented in this subsection. Rather, our assessments are based on the results of other studies and naval war games and discussions with participants in these other activities. References 29, 84, 85, and 86 provided useful background information.

[redacted]

[redacted]

of the size and peacetime deployments of these forces in the late 1980s is given in Table E.1.

[redacted]

DIA (b)(3)

[redacted] Of all these forces, only the SSBNs would be a dedicated nuclear force. The others would operate in their primary roles and would provide nuclear land-attack capabilities if possible.

[redacted]Nuclear Attacks

[redacted]

DIA (b)(3)

[redacted]

[redacted]

[redacted]Table E.1

[redacted] PEACETIME DEPLOYMENTS OF LONG-RANGE NAVAL NUCLEAR FORCES PROJECTED FOR THE LATE 1980s

[redacted]

Nation	[redacted]
[redacted]	

DIA (b)(1) (a)(3)

DNA (b)(3)

[redacted]Table E.2

[redacted] PEACETIME DEPLOYMENTS OF POSSIBLE FUTURE SLCM FORCES

[redacted]

DIA (b)(1) (a)(1) (a)(3)

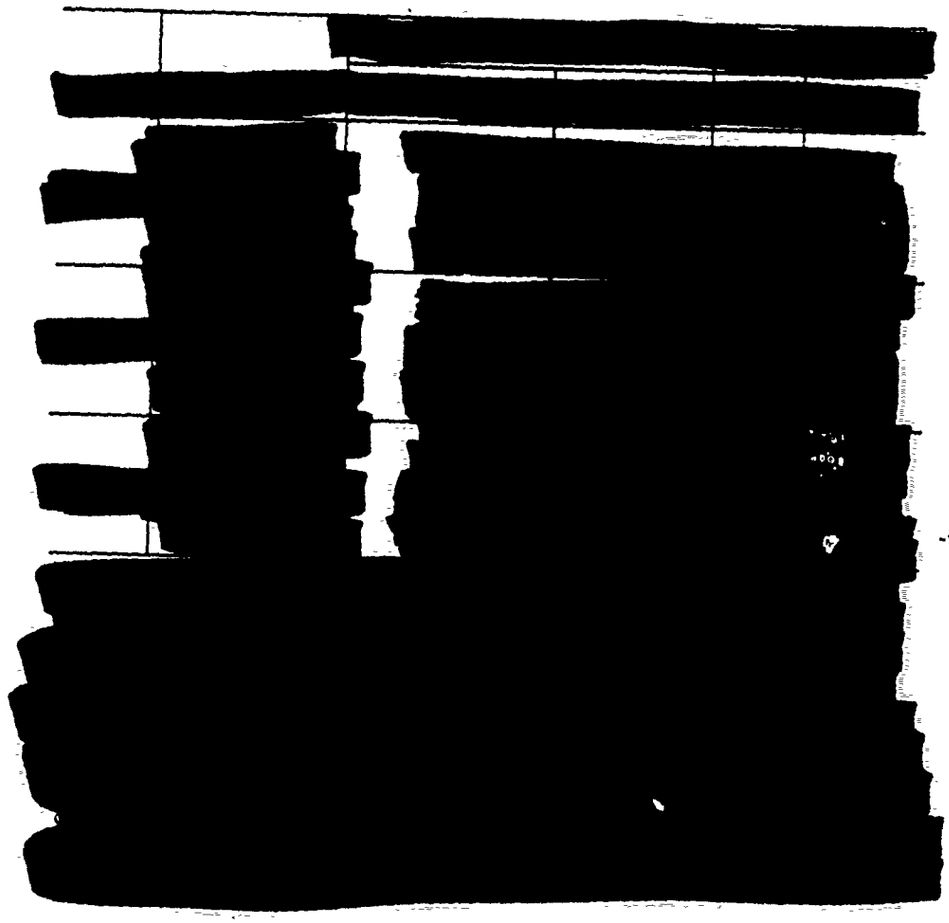
[redacted]

[redacted]

[redacted] Table E.3

[redacted] SURVIVABILITY AND AVAILABILITY OF NATO'S NAVAL NUCLEAR FORCES AFTER WARSAW PACT NUCLEAR ATTACKS ON D-DAY

[redacted]



DIA (6)(1) (a)(1) (a)(3)

[redacted] Conventional Attacks

[redacted]

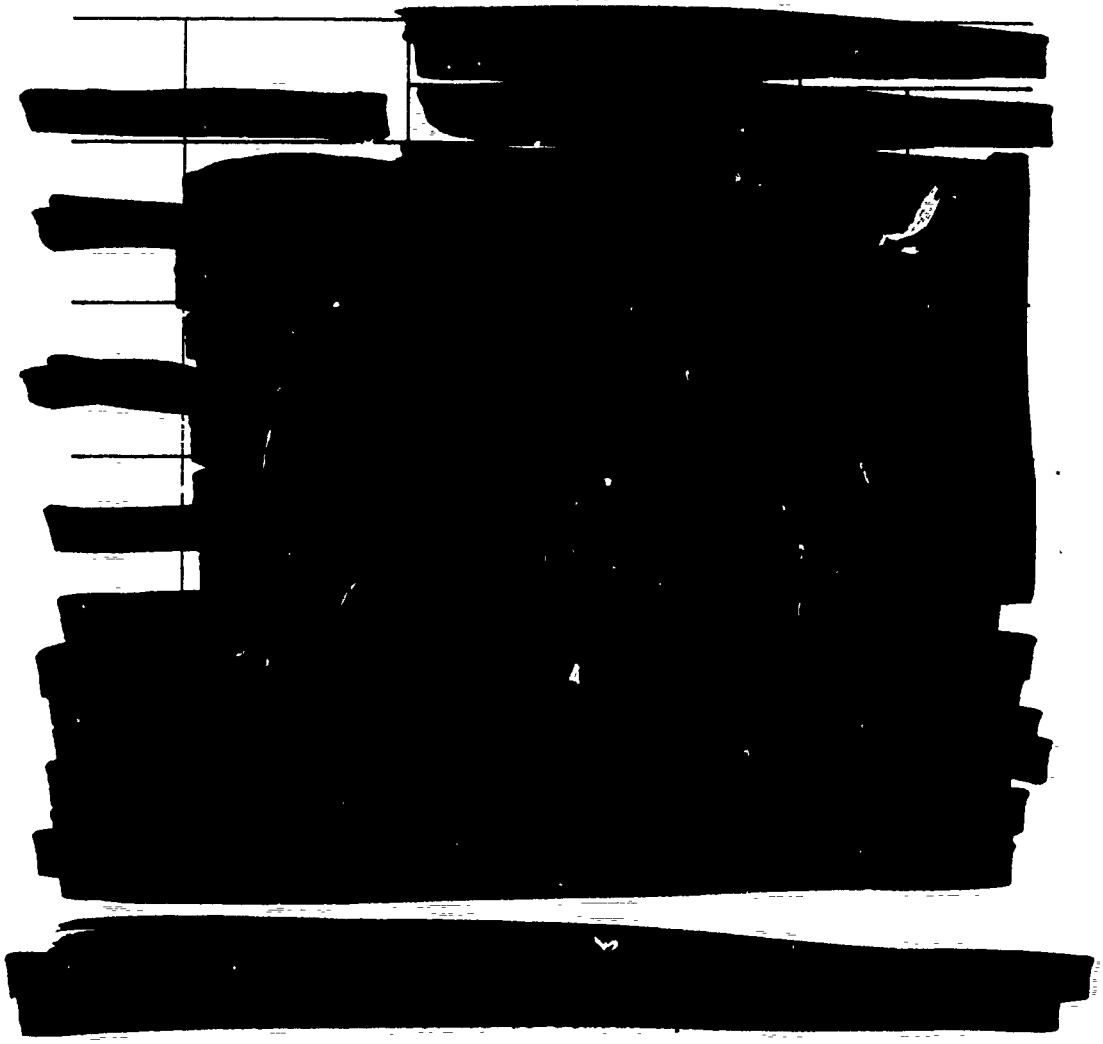
[redacted]

[redacted]

Table E.4

[redacted] SURVIVABILITY AND AVAILABILITY OF NATO'S NAVAL NUCLEAR FORCES AFTER WARSAW PACT CONVENTIONAL ATTACKS ON D-DAY

[redacted]



DIA (6) (a)

[redacted] ostattack Endurance

[redacted]

[redacted]

[redacted]

[redacted] The postattack survivability of the surface ships in the West Atlantic can be enhanced considerably by nuclear counterattacks against Soviet naval forces at sea and in port as well as SNA bases in the Western USSR.* If these ships are also protected by SSNs during their transit to Europe, most should survive. However, they would remain vulnerable to follow-on nuclear attacks while operating in European waters, especially in the Norwegian and Mediterranean Seas.

[redacted]

DIA (b)(1) (a)(3)

DIA (b)(1) (a)(1) (a)(3)

Page 181 is deleted.
DIA (b)(1)
(a)(1) + (b)(3)

[redacted]

[redacted]

[redacted] Annex 1 to Appendix E

[redacted] SILO-BASED MRBM SYSTEM DESIGN AND SURVIVABILITY

[redacted] This annex deals with the design and survivability of a silo-based MRBM system. The basic system concept is derived from a recent study by the Boeing Company, Ref. 87. The illustrative threat consists of a force of SS-20s with various payloads and accuracies. MRBM system design involves the selection of silo hardness and number of RVs per missile to assure that a desired number of missiles survive an attack by a given threat. MRBM force size and silo spacing are considered as a function of the size, payload, accuracy, and tactics of the attacking force. Other issues addressed include (1) deployment area possibilities, (2) a deployment strategy that involves converting some silo-based MRBMs to ground-mobile MRBMs to cope with possible SS-20s CEP reductions, and (3) silo vulnerability to conventional munitions.

[redacted] SYSTEM CONCEPT

(U) The results of a recent Boeing Company study of MRBM deployment options in Europe are used in this annex to illustrate a silo-based MRBM concept and to assess system survivability against nuclear attacks.(87)

[redacted] Missile Options

[redacted]

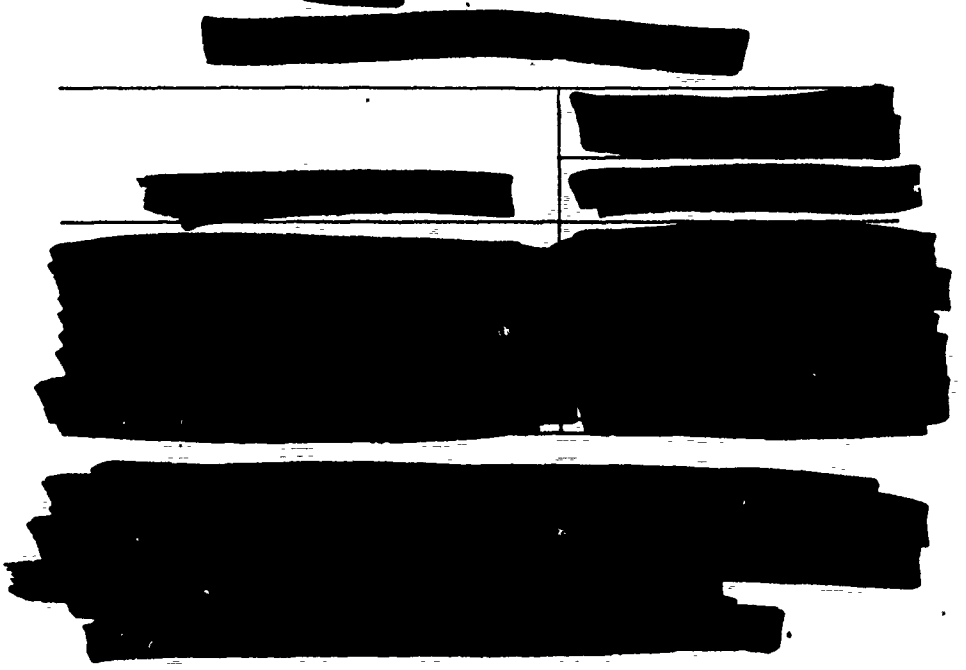
DASD (NF+ACP) (b)(1) Sec 1.3(a) (1), (2)

[redacted]

[redacted]

[redacted] Table E.5

[redacted] MRBM DESIGNS



DNA (b)(3)

[redacted] Missile Silos

[redacted] A typical MRBM silo consists of a buried reinforced concrete cylinder with a composite concrete and steel closure. The missile would be canisterized for cold launch, utilizing a sabot and gas generator system that provides the missile a nominal 23 mps velocity. All operational support equipment would be housed in a separate canister attached to the base of the missile launch canister.

[redacted] The Boeing design studies considered silo hardness levels in the 2 to 14 MPa range. Silo dimensions and costs were derived on the basis of empirical relationships developed for the Minuteman and MX programs. At higher overpressures, silo dimensions and costs are driven up by rattlespace requirements for missile shock isolation, assumed as 1.5 times the peak horizontal and 3 times the peak vertical ground displacements. If the silos were located in dry soil to minimize ground shock displacements, the following peak displacements would result from a 500-KT surface burst:

[redacted]

[redacted]

Overpressure (MPa)	Peak Displacement (cm)	
	Horizontal	Vertical
2	20	30
7	69	122
14	104	211

[redacted] Silo costs consist of fixed and variable elements. The fixed costs are for the various mechanical and electrical systems in the silo; they are independent of silo hardness and practically independent of silo size. The fixed cost is estimated to be about $140,000 per silo. The variable costs are a function of silo hardness, as shown below:

Hardness (MPa)	Cost ($)
7	60,000
14	140,000
21	400,000

These estimates are based on the deployment of a few hundred silos. That for the 21-MPa silo has been extrapolated from estimates in Ref. 88. As seen, the variable silo cost increases rapidly at higher hardness levels, primarily because more rattlespace is needed to accomodate peak ground displacements from surface bursts. However, silo costs would be a small fraction of total system cost For a system with 450 single-BRV MRBMs in 21-MPa silos, silos cost would be about 10 percent of the system's life cycle cost. (See Table D.2 in Appendix D for a comparison of the costs of silo and other basing modes.)

[redacted] Deployment Concept and C^3

In the Boeing system, an MRBM unit would consist of five missile silos controlled by a mobile LCV. The LCVs would normally be located in bunkers designed to protect them from small arms and terrorist-type attacks; they would be dispersed to the field during alert conditions. The LCV bunkers and silos would be located on existing military bases to minimize peacetime manning and security problems and interfaces with the public.

[redacted]

[redacted]

[redacted]Five MRBM units would form an operational squadron, two or more squadrons an operational wing. Each wing would have a soft operational control center for peacetime operation, a maintenance and security facility, and a missile assembly building.

[redacted]Communication within an MRBM wing would be by landlines with medium, high, and ultra high frequency radio links as backup. The wartime interface with external higher commands would be through the dispersed LCVs.

[redacted] ILLUSTRATIVE NUCLEAR THREAT

[redacted]

DNA (6)(3)

[redacted] Table E.6

[redacted] ILLUSTRATIVE SS-20 MIRV PAYLOADS

[redacted]

DIA (6)(1) (9)(4)

[redacted]

[redacted]

[redacted] Accuracy

[redacted]

DIA (6)(1) (a)(4)

[redacted] Reliability

[redacted]

[redacted]

DIA (6)(1) (a)(4)

[redacted]

[redacted] MRBM SYSTEM DESIGN

Silo hardness and number of RVs per missile are two system parameters that can be determined on the basis of cost and survivability considerations. To illustrate this process, 7-, 14-, and 21-MPa silos and 1, 2, and 3 RVs per missile are considered. The result is that a 3-RV MRBM in a 21-MPa silo appears most cost-effective in assuring the survival of 300 RVs after an attack by 300 SS-20s.

[redacted]

DIA (6)(1) (a)(4)

[redacted]

[redacted]

[redacted] Silo Hardness

[redacted] To determine silo hardness, the number of MRBMs needed for 100 missiles (300 RVs) to survive an attack by 300 SS-20s is shown in Fig. E.4 for a range of threat parameters. Damage probabilities are calculated with the DIA vulnerability number (VN) methodology.[91] (VNs of 40P5, 44P5, and 46P5 are used for the 7-, 14-, and 21-MPa silos, respectively.)

[redacted] Figure E.4 shows the MRBM force size needed to assure 100 surviving missiles as a function of CEP for the three hardness levels. The solid lines refer to the current SS-20 payload of 3 RVs; the dashed lines refer to more highly MIRVed payloads, where the number of RVs is optimized as a function of CEP to maximize damage. The attack is assumed to consist of several waves to permit all of the SS-20 RVs to be used without fratricide.

[redacted] Against the current SS-20 payload, increased hardness reduced force size requirements at larger CEPs but not at very small CEPs. Against possible future payloads, force size requirements are reduced with increased hardness at all CEPs. Furthermore, increased hardness demands progressively greater improvements in CEP before MIRV retrofits become more effective than the current payloads. Against 21-MPa silos, CEPs less than 120 m are required for significant improvement in payload effectiveness.

[redacted] Using cost data in the Boeing study, it appears that the life cycle costs of MRBM forces for 100 surviving missiles in 14- and 21-MPa silos are about equal and about 10 percent less than forces deployed in 7-MPa silos. However, 21-MPa silos are preferred for two reasons. First, superhard silos demand very small CEPs for the effective use of highly MIRVed SS-20 payloads. And, second, as will be discussed later, superhard silos enable small silo spacing and deployment area requirements.

[redacted] Number of RVs per MRBM

[redacted] To determine the number of RVs per MRBM, an MRBM force deployed in 21-MPa silos and carrying 1, 2, or 3 RVs per missile is considered. Figure E.5 shows the initial force size to assure 300

[redacted]

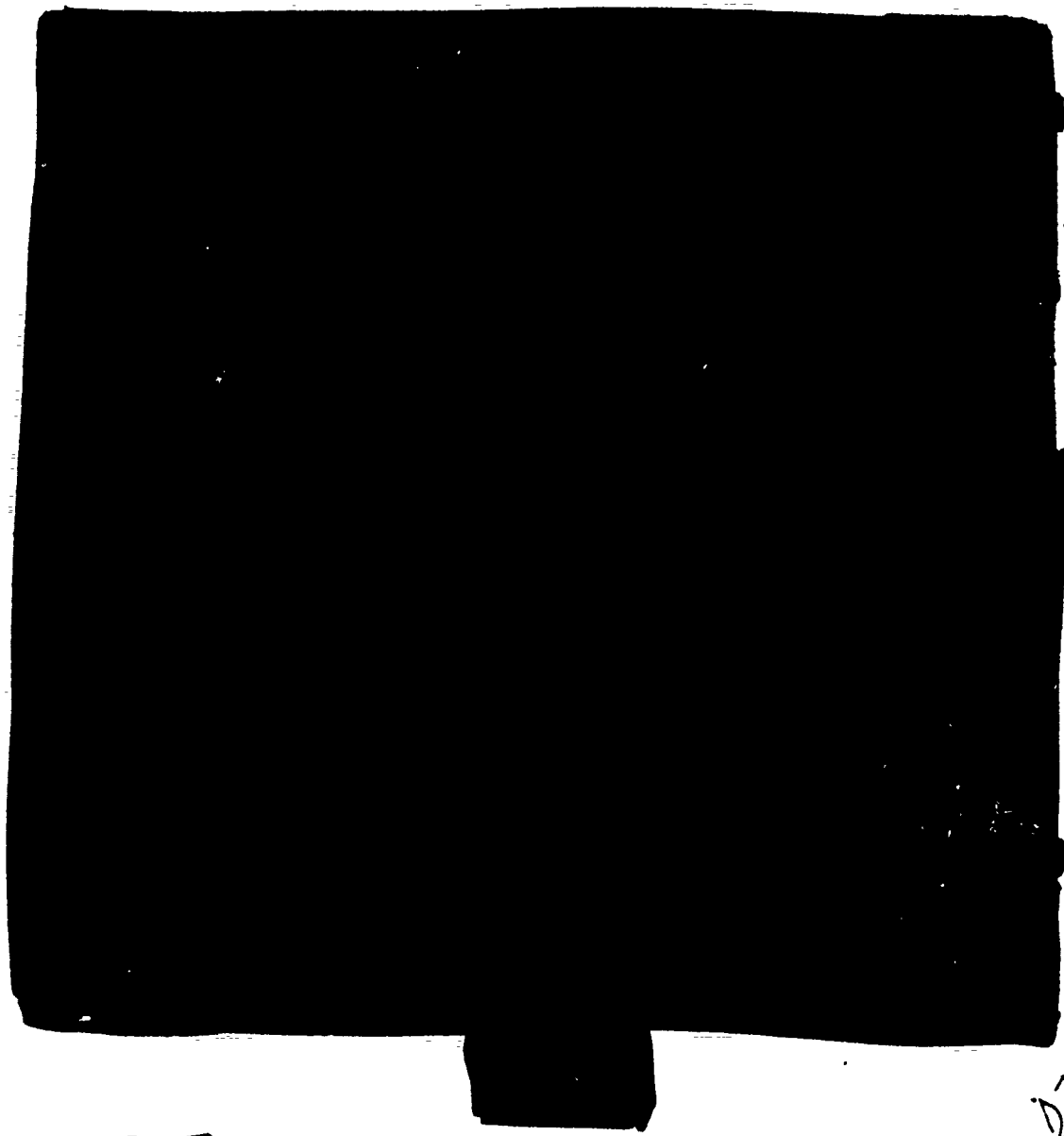
[redacted]



DIA (b)(1) (a)(1)

[redacted]ig. E.4 — Initial MRBM force size to assure 100 surviving missiles in an attack by 300 SS-20s

[redacted]



[redacted] Fig. E.5 — Initial MRBM force size to assure 300 surviving RVs in an attack by 300 SS-20s

[redacted]

[redacted]

surviving RVs in an attack by 300 SS-20s. As shown, MIRVed MRBMs lead to smaller forces. Again using cost data in the Boeing study, it appears that a force of 3-RV MRBMs is about 10 percent less expensive than a force of 1-RV MRBMs to assure 300 surviving RVs.

[redacted] MRBM SURVIVABILITY AND FORCE SIZE

[redacted] MRBM force size has been considered above as a function of SS-20 CEP and MIRVing in connection with MRBM system design. The effects of attack size and tactics (postlaunch retargeting and shoot-look-shoot) are considered here.

[redacted] Attack Size

[redacted] Figure E.6 shows initial MRBM force size for 100 surviving missiles as a function of attack size for a range of CEPs and one case of optimal MIRVing. The MRBMs are assumed to carry 3 RVs and to be located in 21-MPa silos.

[redacted]

DASD (NF+ACP) (b)(1) Sec 1.3(a) (2)

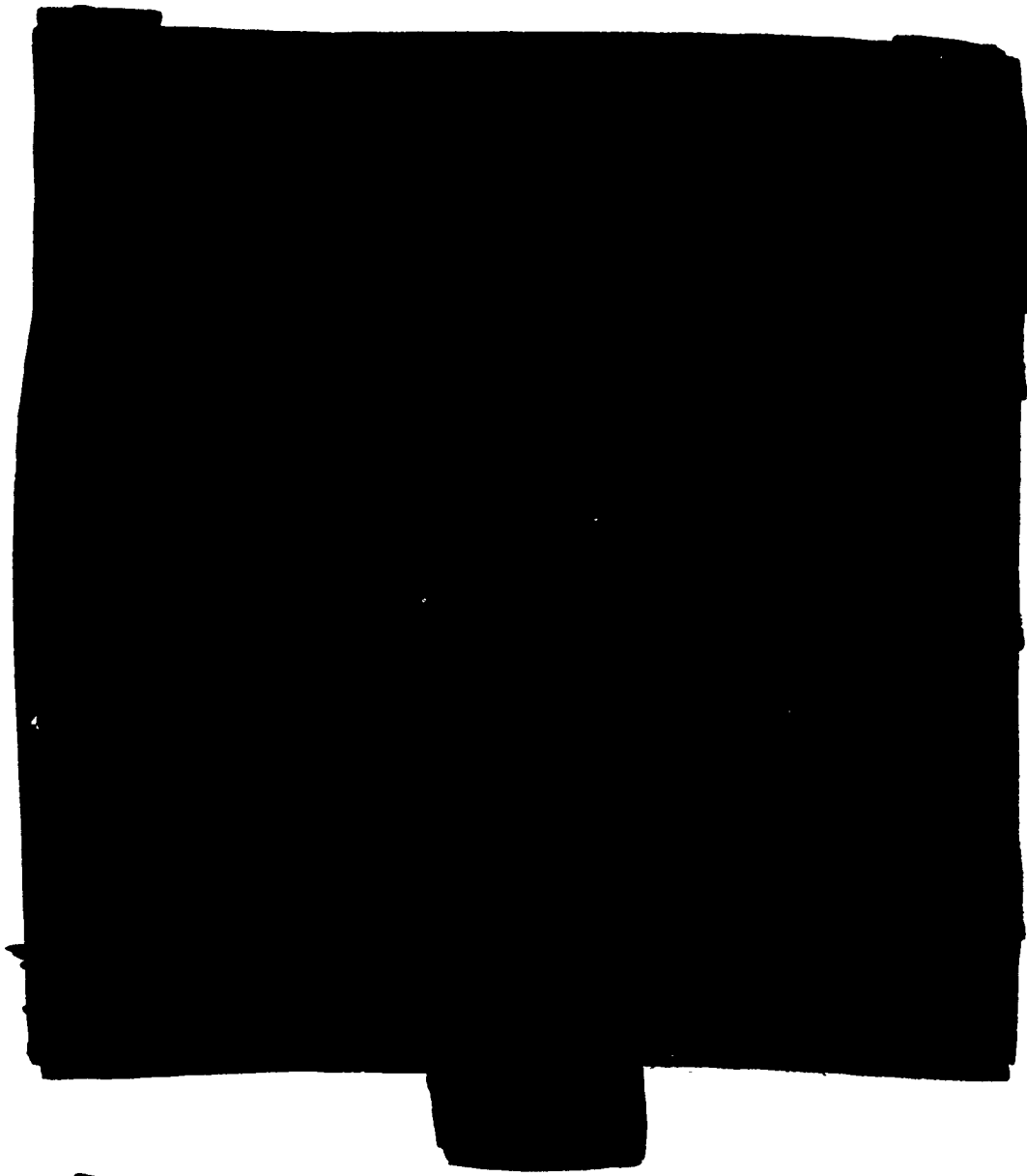
[redacted] Attack Tactics

[redacted] Time-coordinated, multi-salvo attacks have been assumed thus far in this annex. The effects of such tactics as postlaunch retargeting and shoot-look-shoot are considered here.

[redacted] In salvo attacks, about 10 percent of the attack force is assumed to abort because of nonavailability and launch failures. Since it can be known which missiles do not go, attack effectiveness can be increased slightly by postlaunch retargeting of reserve missiles. To be consistent with previous analyses, it is assumed that 26 out of 300 SS-20s would be withheld as a reserve for retargeting.

[redacted]

[redacted]



[redacted]

Fig. E.6 — Initial MRBM force size to assure 100 surviving missiles as a function of number of SS-20s

DIA (b)(3)

[redacted]

[redacted]

[redacted] Much greater attack effectiveness can be obtained with shoot-look-shoot tactics, assuming that (1) it is possible to observe the damage and identify the missiles that survive prior attacks, and (2) the surviving missiles are not fired before the next wave arrives.

[redacted] The effects of attack tactics on initial MRBM force size for 100 surviving missiles is shown in Fig. E.7. Retargeting for launch aborts and failures has very little effect. Shoot-look-shoot attacks are considerably more effective than salvo attacks, especially with lower CEPs and optimal MIRVing.

[redacted] SILO SPACING

[redacted]

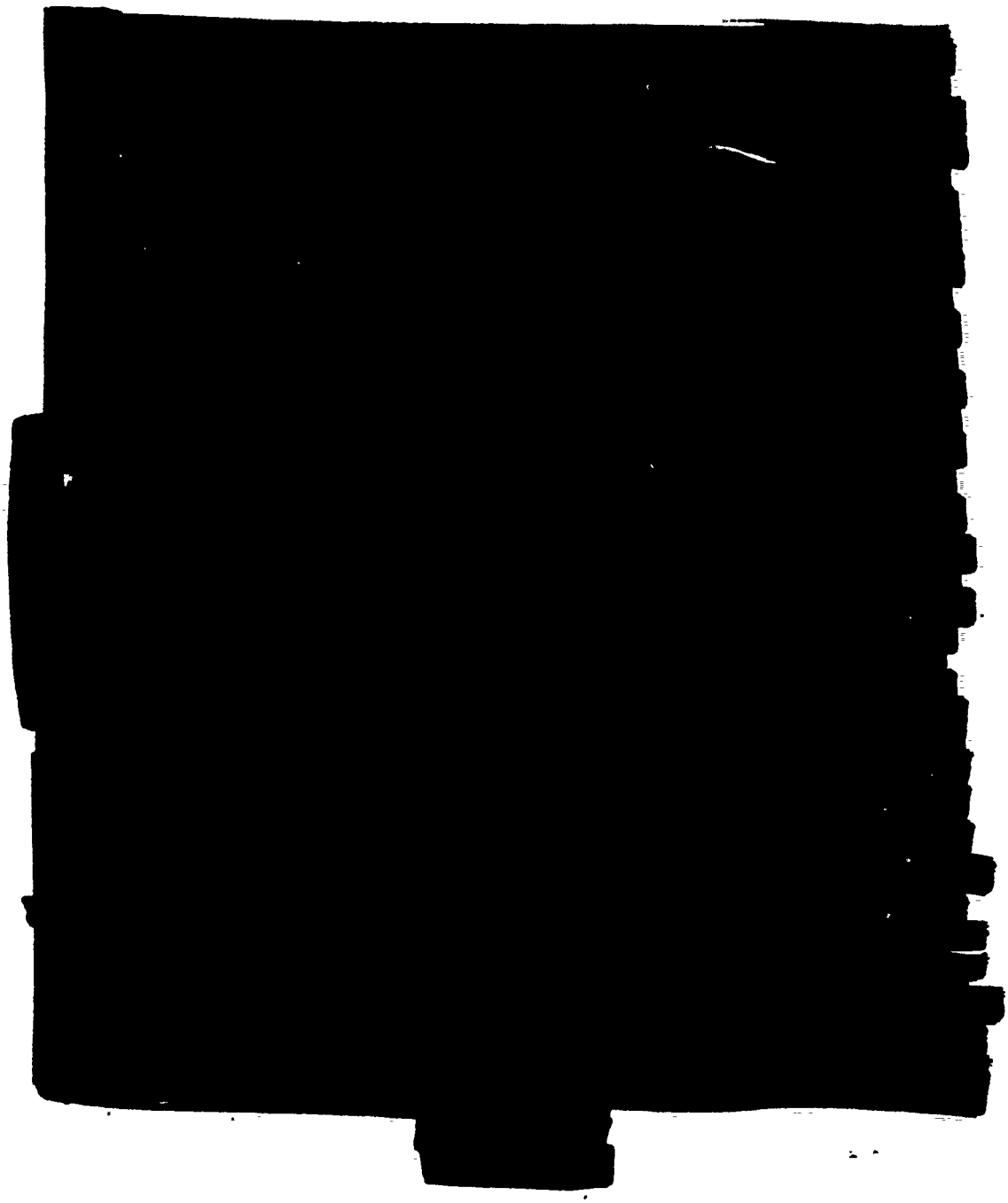
DIA (b)(1) (a)(4)

DIA (b)(1) (a)(4)

[redacted]

DNA (b)(3)

[redacted]

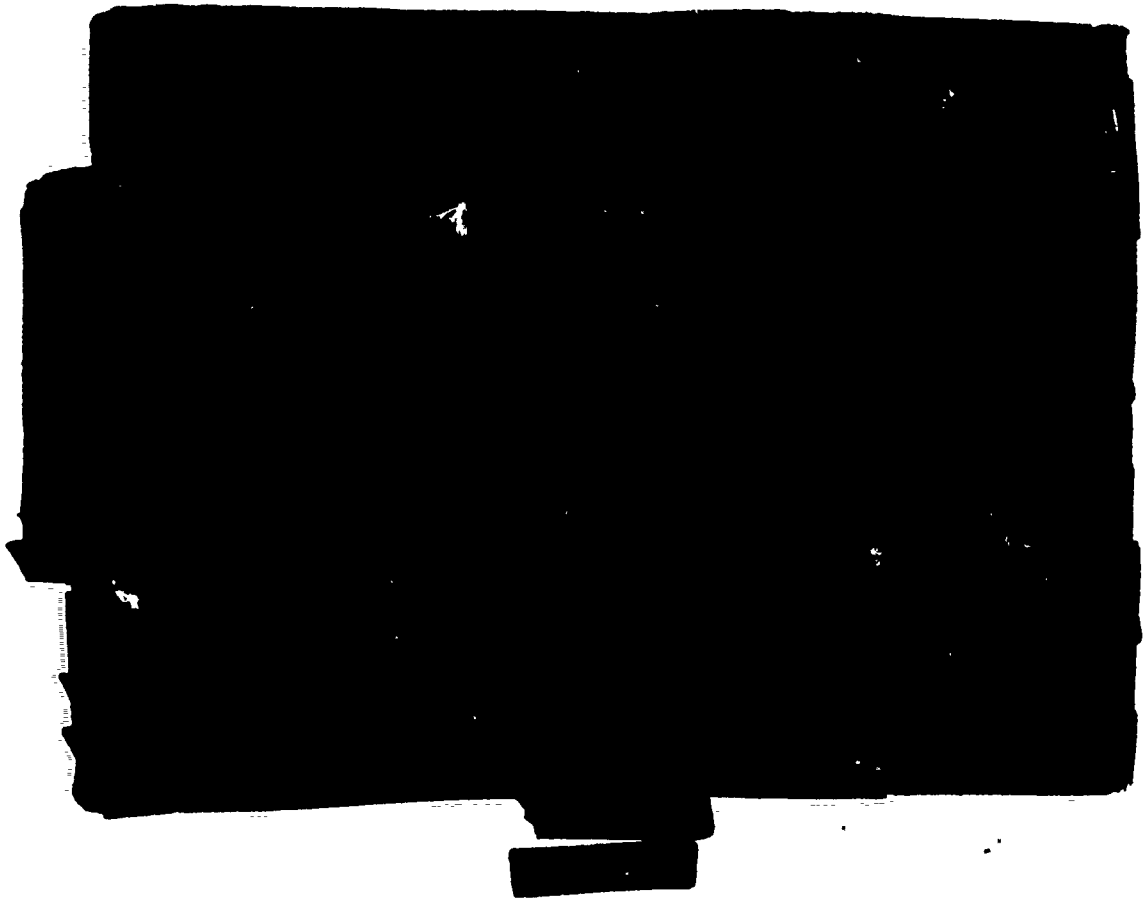


[redacted]ig. E.7 — Initial MRBM force size to assure 100 surv[redacted] missiles as a function of attack tactics with 300 SS-20[redacted]

DIA (b)(1) (a)(2)

[redacted]

[redacted]

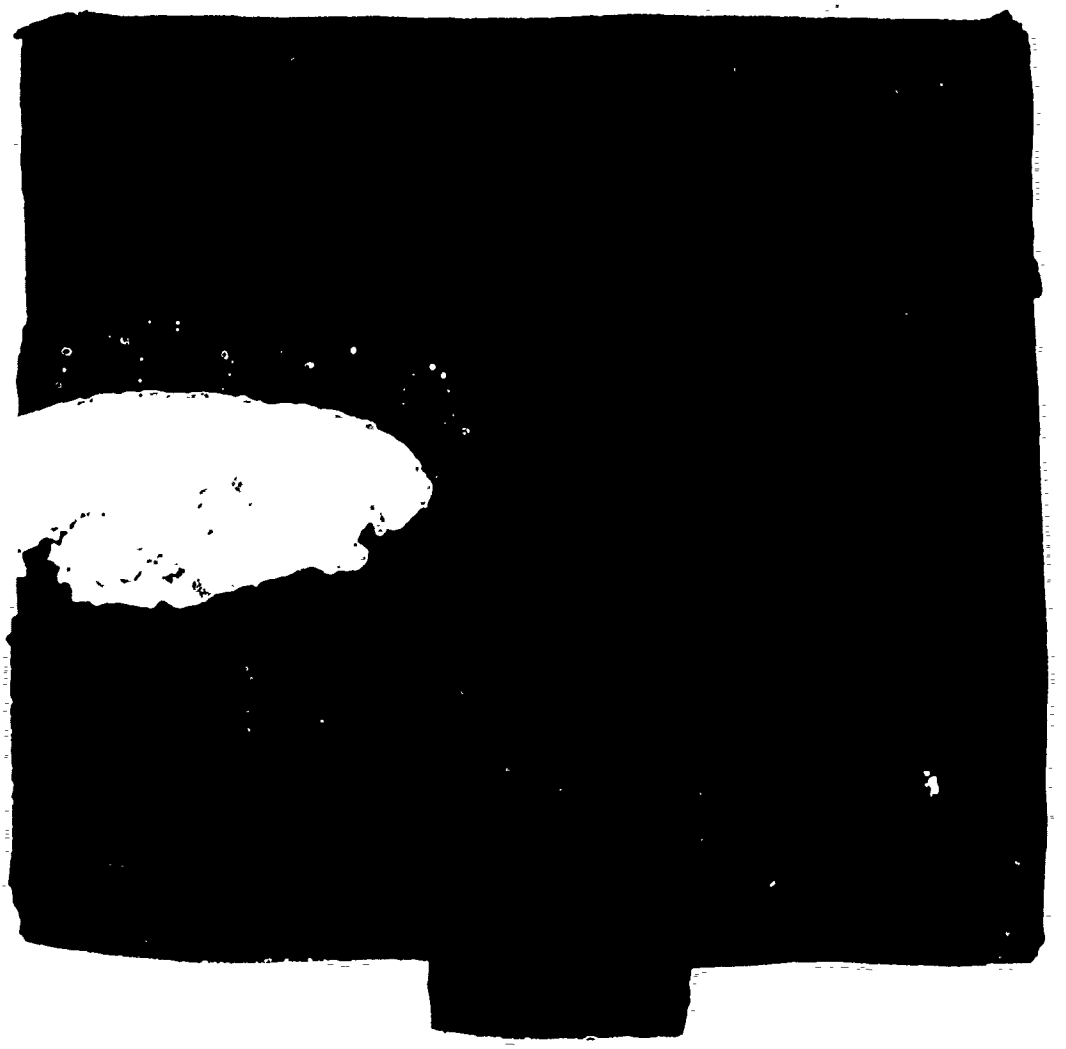


DIA
(b)(1)
(a)(2)

[redacted] Fig. E.8 — Expected damage by a single SS-20

[redacted]

[redacted]



DIA (b)(1) (a)(3)

[redacted] Fig. E.9 — Initial MRBM force size to assure 100 surviving missiles as a function of silo spacing in attacks by 300 SS-20s with single RVs or MIRVs

[redacted]

[redacted]

be preferred over optimal MIRVing with a 90-m CEP when silo spacings are less than about 450 m.

[redacted] DEPLOYMENT AREAS

Silo locations on military air bases and large ammunition depots in the United Kingdom, Belgium, The Netherlands, and the FRG (west of the Rhine) have been considered.* With a silo spacing of about 750 m, it was determined that about 10 silos could be located on an air base and one silo per 32 hectares could be located on an ammunition depot. However, no assessments have been made of the political, technical, or operational feasibility of such deployments.

(U) Table A.1 in Appendix A shows the numbers of air bases of various categories, ownerships, and locations that might be used. If missile silos are limited to those on which the United States has in-place aircraft or plans for aircraft deployments on mobilization, a total of 25 airbases might be used and 250 silos could be placed on them. If the 24 other NATO MOBs could also be used, a total of about 500 silos could be placed on military air bases west of the Rhine. The depots of Miesau, Fischbach, Kriegsfeld, and Dahn in the FRG are large enough for 30, 20, 15, and 10 silos, respectively. Thus, about 100 silos could be located on these facilities.

(U) This brief survey of possible deployment areas indicates that at least 600 silos might be located on NATO military installations west of the Rhine.

[redacted] A DEPLOYMENT STRATEGY

[redacted]

DASD (NE+ACP) (b)(1) Sec. 1.3 (a)(1)

[redacted] Other facilities such as supply depots, headquarters, SAM sites, casernes, and training areas were judged to be unsuitable for one or more of the following reasons: lack of security, inadequate size, proximity to civilians or military personnel, or incompatibility with activities at the facility.

[redacted]

[redacted]

[redacted] However, the advanced threats considered are hypothetical and may not materialize in the future. If they do arise, the process is likely to be evolutionary. This means that there may be time for reactions and other countermeasures.

[redacted] Because silo proliferation alone will not be cost-effective, a different deployment strategy is considered. In it threat growth would be countered by first adding silo-based MRBMs and then by making some mobile. This dual-mode deployment strategy would be implemented as follows:

[redacted]

1. Configure the MRBM missile and its canister for fixed-silo, ground-mobile, or shell-game basing.

[redacted]

2. Select a maximum size for the silo-based force. This could depend on many considerations, including anticipated threat growth, desired survivability, costs, deployment area availability, treaty limits on force size, etc.

[redacted]

3. Size and deploy an initial silo-based force against the projected threat for the time at which the system would reach its full operational capability. Select the silo spacing on the basis of maximum force size from step 2 above.

[redacted]

4. Add missiles and silos to counter threat growth, if and as needed, until the maximum force size is reached.

[redacted]

5. Counter further threat growth by converting some of the silo-based missiles into ground-mobile missiles. The missiles that remain in silos would be moved at random as in a shell game to keep the Soviets from knowing which silos are occupied.

[redacted]

DIA (b)(1) (a)(1)(A)

[redacted]

[redacted]

[redacted]

DIA (b)(1) (a)(2)

DIA (b)(1) (a)(2)

Further threat growth would be countered by deploying a part of the force in a ground-mobile mode while operating the missiles remaining in silos in a shell-game mode. The number of MRBMs to be deployed in the ground-mobile mode as a function of SS-20 CEP is shown in Fig. E.10 various fractions of the ground-mobile MRBMs that might be targeted by the SS-20s. If one is targeted, its damage probability is assumed to be 0.85, [redacted] The other SS-20 RVs are assumed to be fired at the silos without knowledge of which silos contain MRBMs.

(DIA) (b)(1) (a)(2)

[redacted]

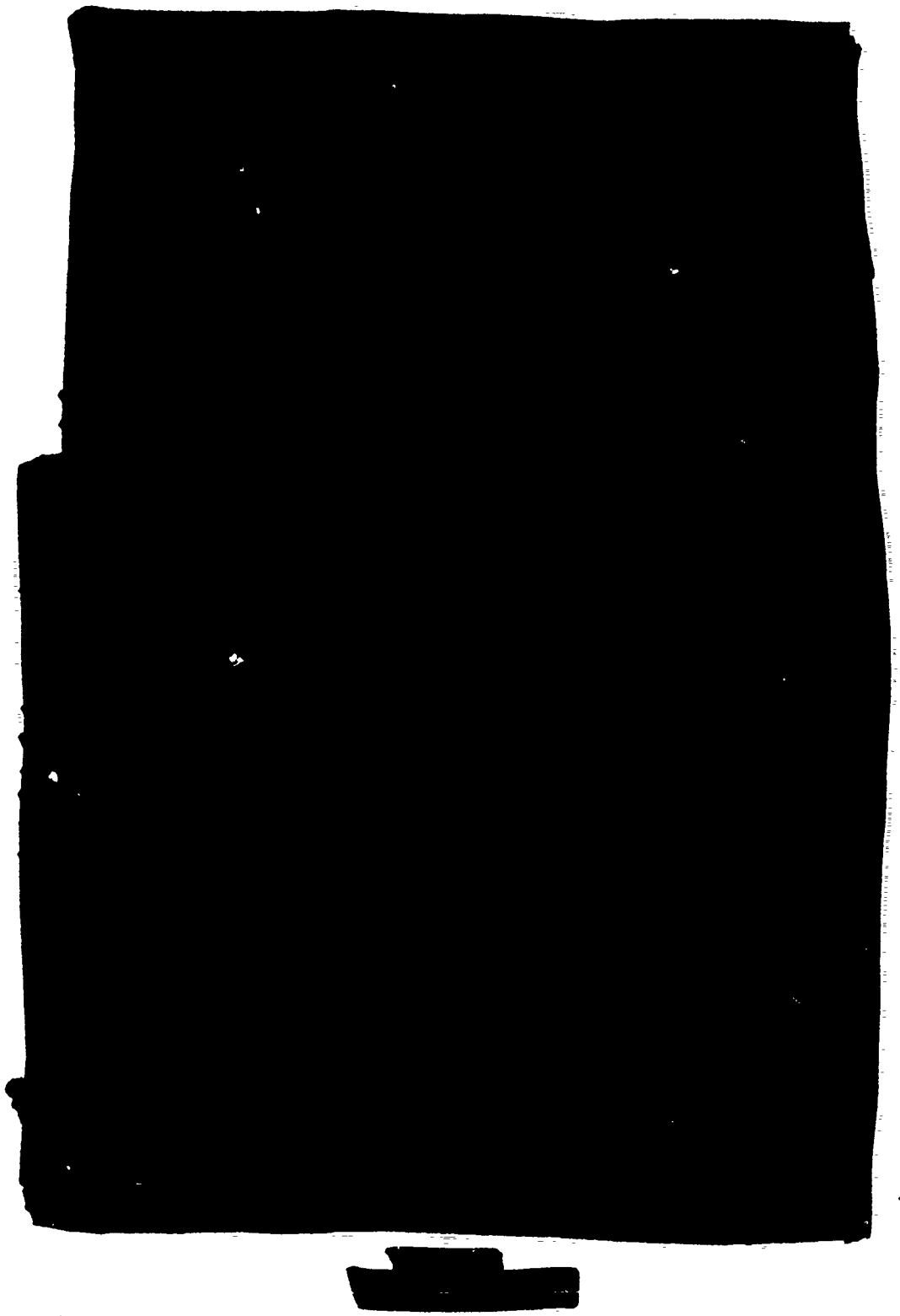
DIA (b)(1) (a)(2)

[redacted]

DIA (b)(1) (a)(2)

[redacted]

[redacted]



[redacted]

[redacted]

Fig. E.10 — Number of ground-mobile MRBMs to assure 100 surviving missiles in an attack by 300 SS-20s

[redacted]

[redacted]

[redacted]

DIA (b)(1) (a)(2)

OTHER ISSUES

[redacted] The system survivability estimates presented in this annex are based on silo hardness or physical vulnerability characteristics as defined in the DIA VN methodology. This assumes that certain other weapon effects, including electromagnetic pulses, can be controlled or nullified by appropriate system design. If this is possible only at greatly increased silo spacing, it may not be feasible to deploy a silo-based system in Europe.

(U) Another issue related to silo spacing is attack timing and fratricide. The time-on-target for surface bursts must be controlled within a fraction of a second to avoid mutual weapon interference--fratricide or trajectory dispersion of follow-on RVs. If these timing constraints cannot be met, dense packing of silos may prevent single-wave attacks against the entire force, thus providing an opportunity to launch a part of the force between the first and second salvos. Although air bursts will greatly simplify the timing problem, fuzing errors may make it more difficult to achieve the greatly improved CEPs necessary to stress silo survivability.

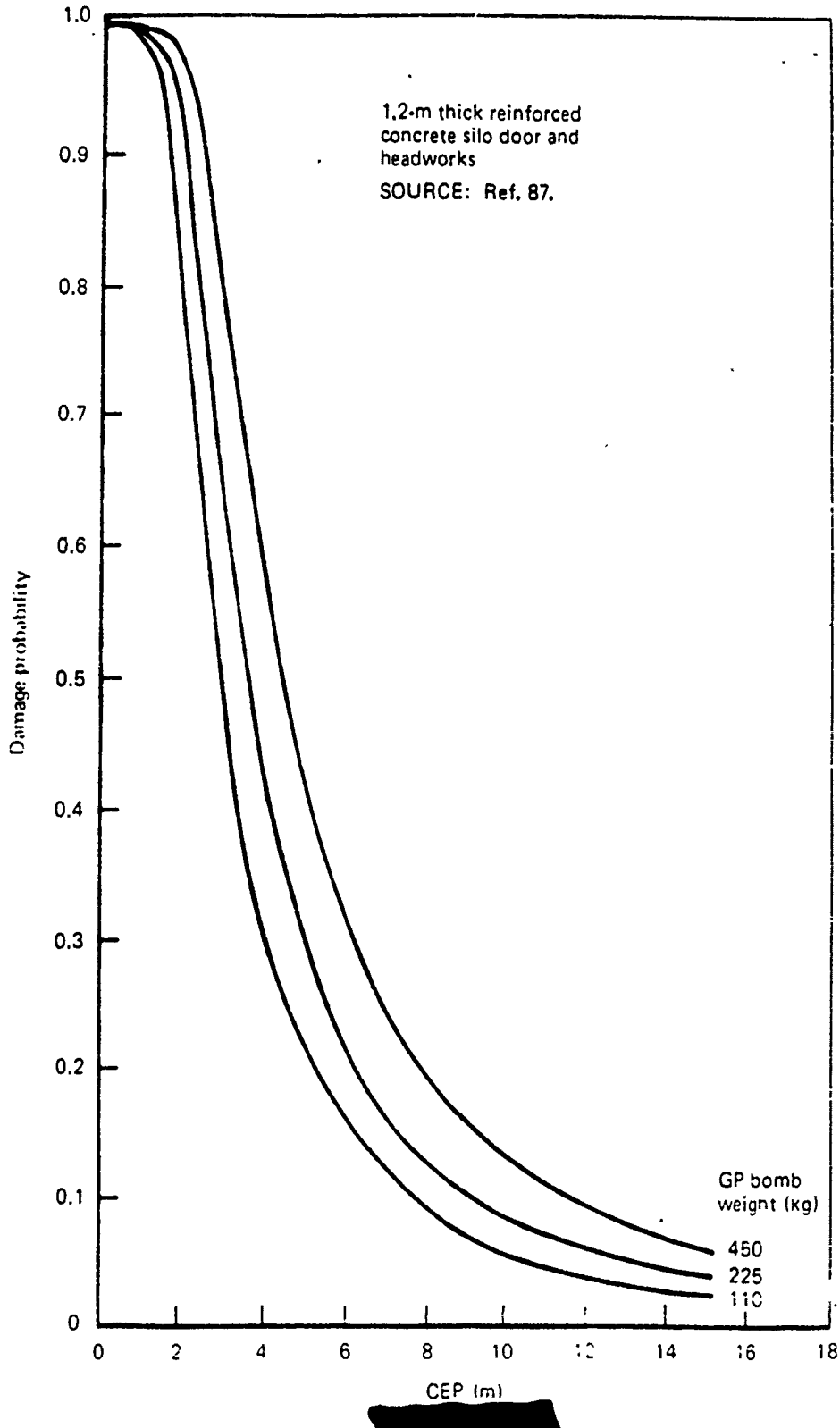
[redacted] Another attack option is the use of air-delivered nuclear weapons. Attack timing and coordination must now consider the safety of aircraft and crews and may significantly prolong the time span needed to attack many closely spaced silos. This will again open up the possibility to launch during an attack.

[redacted]

DIA (b)(1) (a)(2)

[redacted]

[redacted]



[redacted]

Fig. E.11 — General purpose bomb effectiveness against a hard target

[redacted]

[redacted]

[redacted] While there are several countermeasures to accurate weapon delivery, the simplest and least costly is camouflage. In essence, one has to prevent target acquisition by a designator or terminal-homing seeker. Effective camouflage should be possible if it is included as a goal during the initial design of the road network, security fences, cleared areas, and the silo cover.

[redacted]

[redacted]

[redacted] Annex 2 to Appendix E

[redacted] FUTURE WARSAW PACT CONVENTIONAL AIR THREAT AND AIR BASE ATTACK CAPABILITIES IN THE CENTRAL REGION

[redacted] Estimates of Warsaw Pact conventional air threats to rear-area targets in the Central Region of NATO and the United Kingdom in the late 1980s are developed in this annex. They are based on "best" threat projections and a range of current views in the U.S. intelligence and analysis communities as to how the Pact might employ its air forces in the early days of a conventional war in Europe.(19,20,92-95) With these threat estimates, expressed in sorties per day, further estimates of the numbers of NATO's DCA that might be damaged on 15 MOBs in the FRG, Belgium, Netherlands, and United Kingdom during the first 3 days of a conventional war are then developed.

[redacted] CONVENTIONAL AIR THREATS

[redacted] Air Order of Battle

[redacted] Table E.7 gives the numbers of NSWP and Soviet tactical and long-range aircraft projected to oppose the Central Region of NATO in the late 1980s.

[redacted] Air Allocations

[redacted]

DIA (b)(3) (A)

[redacted]

[redacted]

[redacted]able E.7

[redacted] WARSAW PACT TACTICAL AND LONG-RANGE AIRCRAFT
OPPOSING THE CENTRAL REGION OF NATO
IN THE LATE 1980s

[redacted]

Aircraft[a]	Forward Area[b]		Western USSR[c]
	NSWP	Soviet	
[redacted]			

DIA (b)(1) (a)(1)

[redacted]

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DIA (b)(1) (a)(1)

[redacted]

[redacted] Table E.8

[redacted] ALLOCATIONS OF WARSAW PACT TACTICAL AND LONG-RANGE AIRCRAFT IN THE EARLY DAYS OF A CONVENTIONAL WAR: HIGH THREAT TO REAR-AREA TARGETS IN THE CENTRAL REGION OF NATO

[redacted]

[redacted]

DIA (b)(1) (a)(3)

[redacted]

DIA (b)(1) (a)(1)

[redacted] Weapon-Delivery Sortie Potentials Against Rear-Area Targets

[redacted]

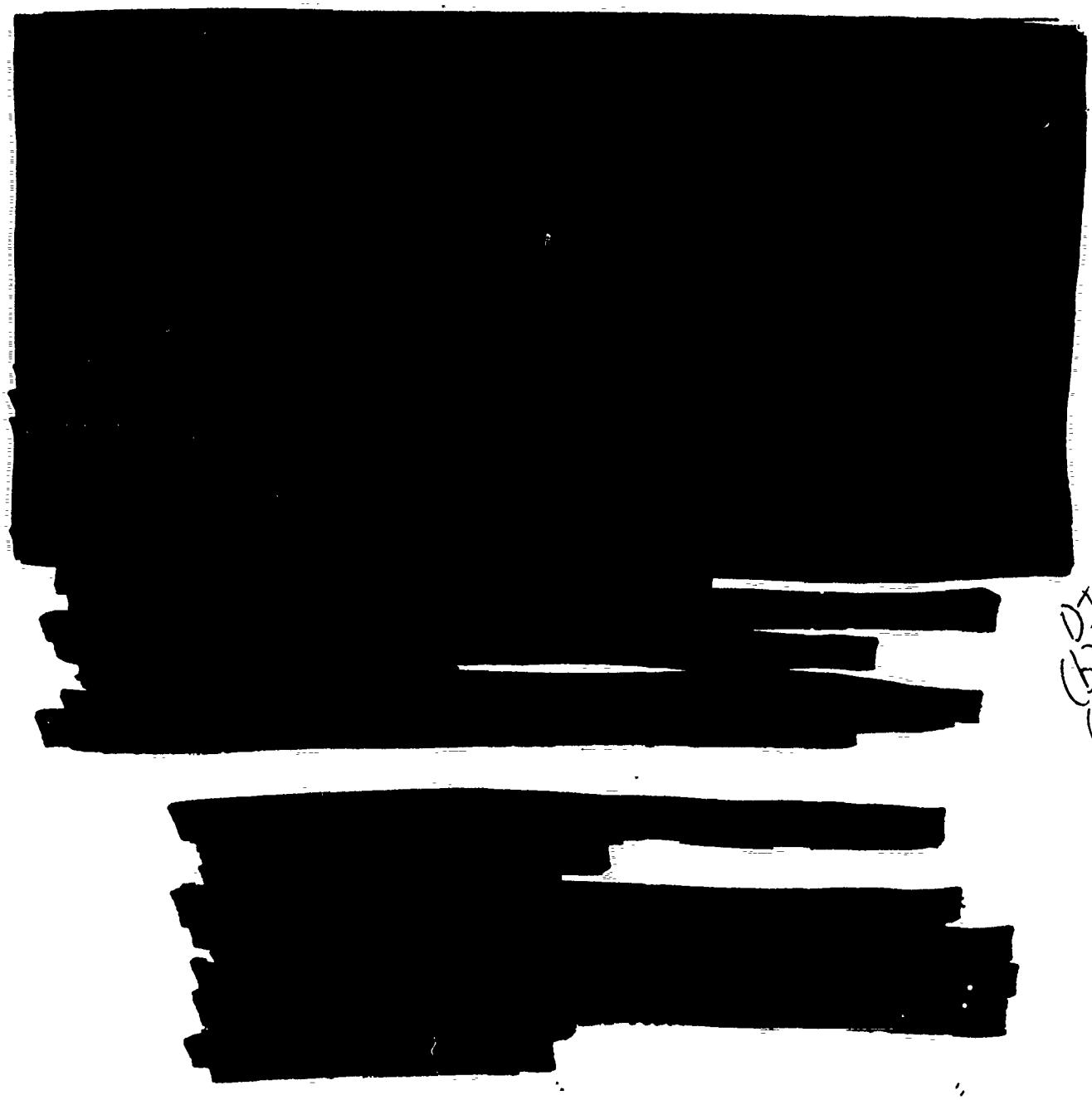
[redacted]

[redacted]

Table E.9

[redacted] ALLOCATIONS OF WARSAW PACT TACTICAL AND LONG-RANGE AIRCRAFT IN THE EARLY DAYS OF A CONVENTIONAL WAR: LOW THREAT TO REAR-AREA TARGETS IN THE CENTRAL REGION OF NATO

[redacted]



DIA (b)(1) (a)(1)

[redacted]

[redacted]

[redacted] Table E.10

[redacted] DAILY WEAPON-DELIVERY SORTIE POTENTIAL AGAINST REAR-AREA TARGETS IN THE CENTRAL REGION

[redacted]

[redacted]

DIA (b)(1) (a)(1)

[redacted]

Attack	Day 1	2	3	4 - 7
First	0.95	0.90	0.85	0.85
Second	0.75	0.75	0.75	--

[redacted]

[redacted]

DIA (b)(1) (a)(1)

[redacted]

[redacted]

[redacted]

[redacted]

Delivery Tactic	Ceiling/ Visibility Minimums (m/km)	Season			
		Spring	Summer	Fall	Winter
Low-altitude level	300/4.8	0.92	0.98	0.82	0.43
Low-angle dive	1500/4.8	0.60	0.76	0.54	0.30
High-angle dive	2700/8.0	0.50	0.70	0.37	0.12

[redacted]

DIA (b)(3)-P.L. 86-36

[redacted]

[redacted]

DIA (b)(3)-P.L. 86-36

[redacted]

[redacted]

[redacted] Bombloads

Table E.11 gives some radius-payload estimates for Pact aircraft as a function of mission profile. Average bombloads for attacks against rear-area targets on the Continent and in the United Kingdom are given in Table E.12 for HLLH mission profiles with low-altitude flight over NATO territory.

[redacted] AIR BASE ATTACK CAPABILITIES

[redacted]

DIA (6)(1) (a)(1)

[redacted] Attack Effectiveness

[redacted]

[redacted]

DIA (6)(1) (a)(1)

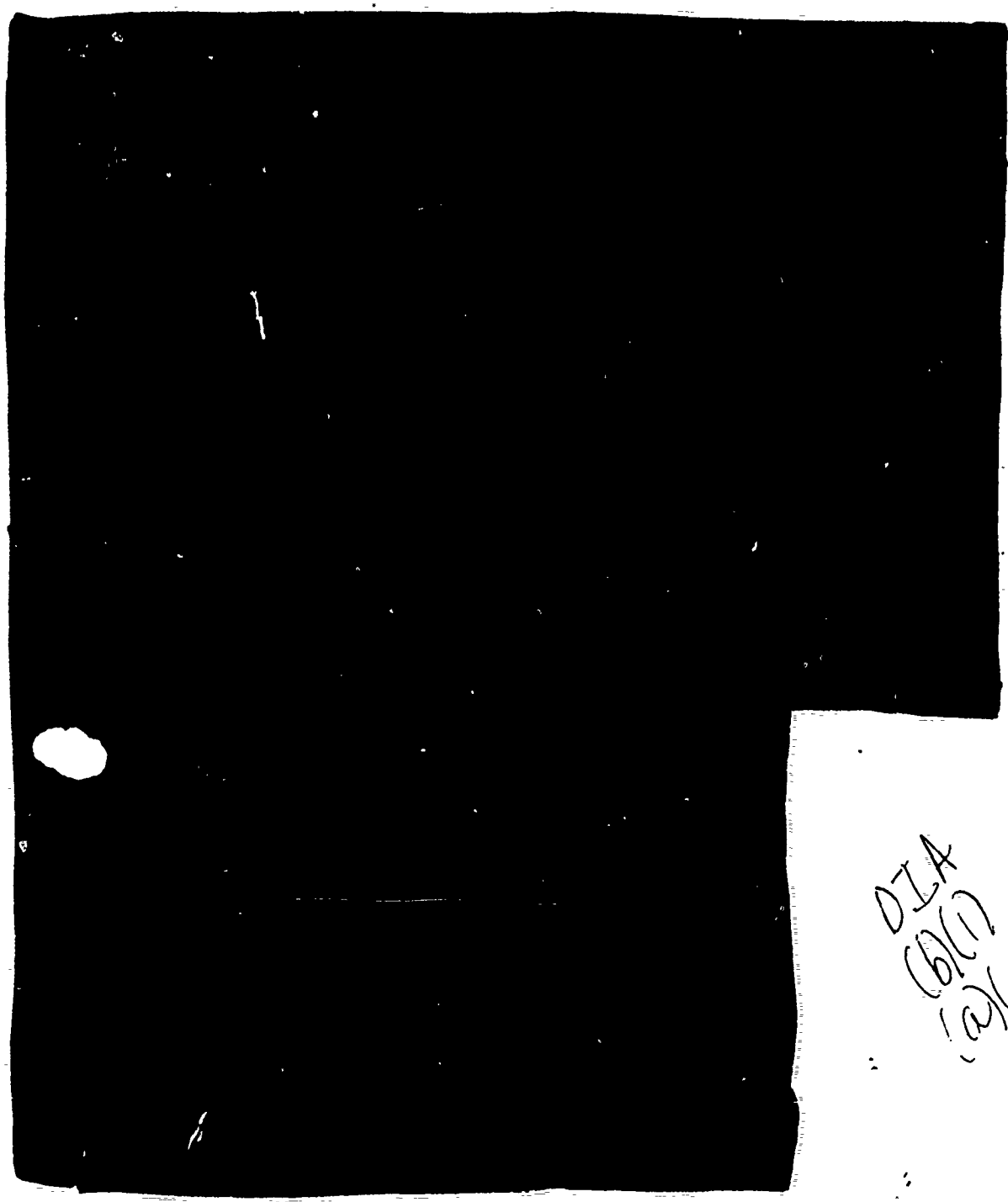
[redacted]

[redacted]

[redacted] Table E.11

[redacted] AIRCRAFT RADIUS-PAYLOAD ESTIMATES

[redacted]



DIA (BC) (2)

[redacted]

[redacted]

[redacted] Table E.12

[redacted] AVERAGE BOMBLOADS AGAINST REAR-AREA TARGETS
ON HLLH MISSION PROFILES

[redacted]

[redacted]

DIA (b)(1) (a)(1)

[redacted] Sortie Allocation

[redacted]

DIA (b)(1) (a)(1)

[redacted]

[redacted]

[redacted]

Table E.13

[redacted] EXPECTED NUMBER OF BOMB HITS AND NEAR MISSES ON SHELTERS PER WEAPON-DELIVERY SORTIE

[redacted]

DIA (b)(1) (a)(1)

DCA Damaged

[redacted]

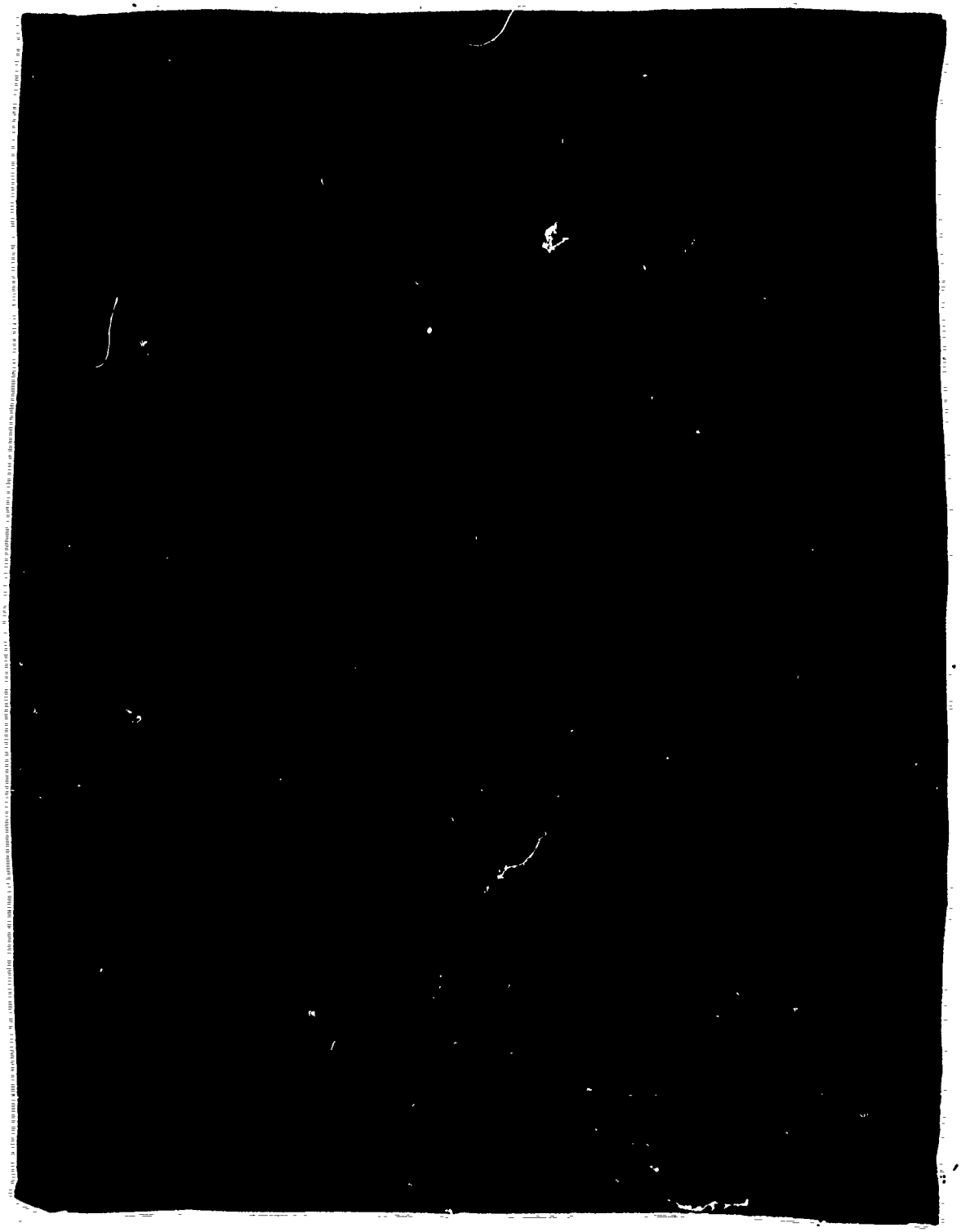
[redacted]

[redacted]

[redacted] Table E.14

[redacted] DUAL-CAPABLE AIRCRAFT SURVIVABILITY

[redacted]



DIA (6X-3)

[redacted]

[redacted]

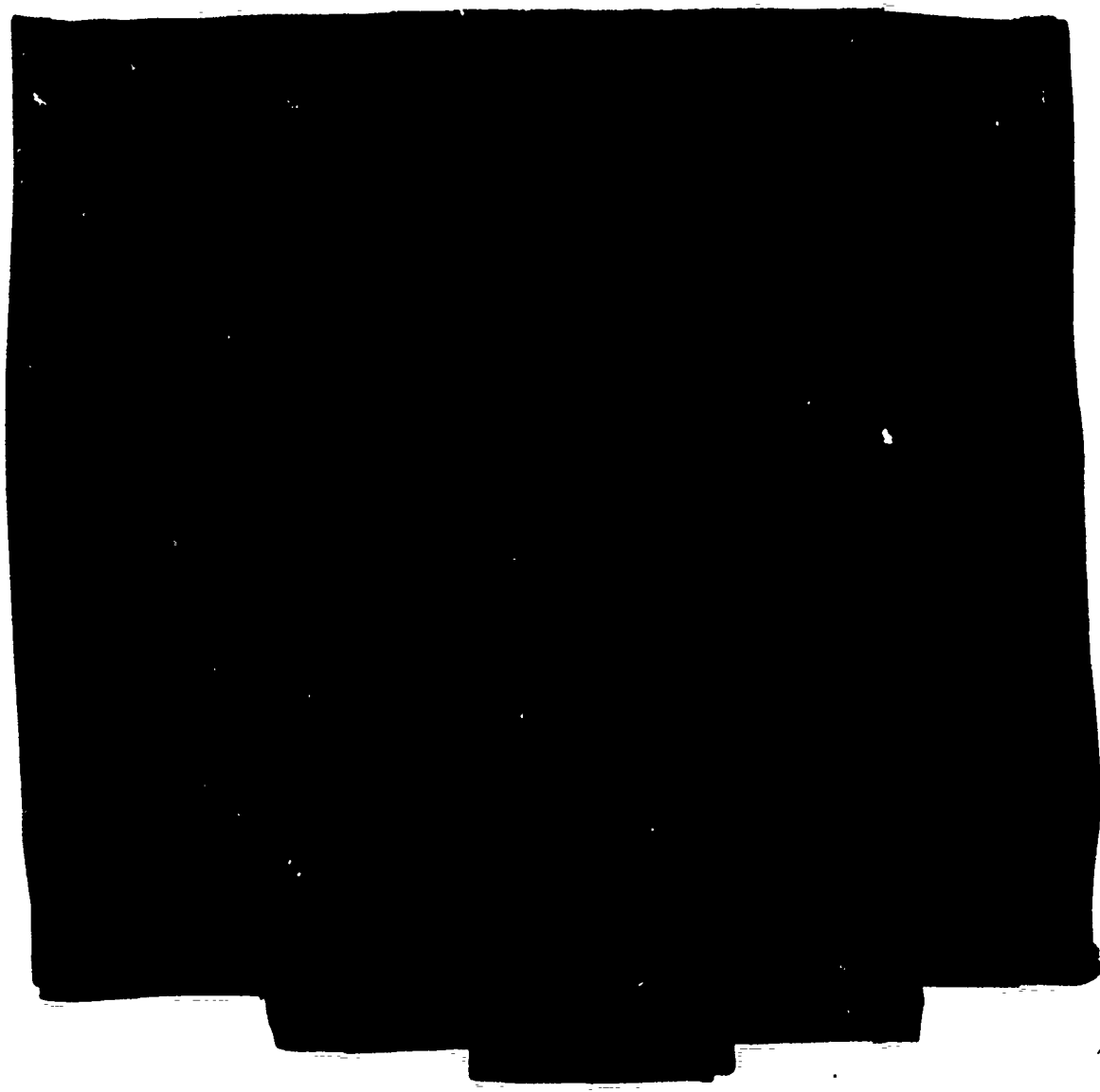


Fig. E.12 — [redacted] Dual-capable aircraft survivability

DIA (b)(1) (a)(1)

[redacted]

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DIA (b)(1) (a)(1)

[redacted]

GLOSSARY

[redacted]

AAA	Antiaircraft artillery
AAM	Air-to-air missile
ABM	Antiballistic missile
ACE	Allied Command, Europe
ACIL	ACE Critical Installation List
ADD	Air Defense District
ADM	Atomic demolition munition
AGL	Above ground level
ALCM	Air-launched cruise missile
ASALM	Advanced strategic air-launched missile
ASBM	Air-to-surface ballistic missile
ASF	Air superiority fighter
ASM	Air-to-surface missile
ASW	Antisubmarine warfare
ATBM	Antitactical ballistic missile
AutoTEL	Autonomous transporter/erector/launcher
AWACS	Airborne Warning and Control System
BENELUX	Belgium, The Netherlands, and Luxembourg
BRV	Ballistic reentry vehicle
C^3	Command, control, and communications
CBU	Cluster bomb unit
CEP	Circular error probable
COB	Colocated operating base
CONUS	Continental United States
DCA	Dual-capable aircraft
DIA	Defense Intelligence Agency
DoD	Department of Defense
DoE	Department of Energy
DSARC	Defense Systems Acquisition Review Council
ECCM	Electronic counter-countermeasures
ECM	Electronic countermeasures
EL	Erector/launcher
EW	Electronic warfare
EW/GCI	Early warning/ground control intercept
FA	Frontal Aviation
FRG	Federal Republic of Germany
GLCM	Ground-launched cruise missile
GP	General purpose
GSE	Ground support equipment
GSF	Ground support fighter
ICBM	Intercontinental ballistic missile
IDS	Interdiction/strike
IOC	Initial operational capability
IRBM	Intermediate-range ballistic missile
KEP	Kinetic-energy penetrator
KT	Kiloton
LCV	Launch control vehicle
LRA	Long-Range Aviation

[redacted]

[redacted]

LTDP	Long-Term Defense Program
MaRV	Maneuvering reentry vehicle
MBRF	Mutual and Balanced Force Reductions
MD	Military District
MIRV	Multiple, independently targetable reentry vehicle
MOB	Main operating base
MPa	Megapascal
MRBM	Medium-range ballistic missile
MRV	Multiple reentry vehicle
MT	Megaton
MX	Missile experimental
NATO	North Atlantic Treaty Organization
NGA	NATO Guidelines Area
NSWP	Non-Soviet Warsaw Pact
O&S	Operations and Support
PGM	Precision-guided munition
PLS	Prelaunch survivability
POC	Program of cooperation
POL	Petroleum, oil, and lubricants
PSP	Priority Strike Program
PTO	Prevent takeoff
QRA	Quick reaction alert
RAF	Royal Air Force
RCS	Radar cross section
RDT&E	Research, development, test, and evaluation
RECIL	Regional Critical Installation List
RV	Reentry vehicle
SACEUR	Supreme Allied Commander, Europe
SALT	Strategic Arms Limitations Talks
SAM	Surface-to-air missile
SEP	Selective Employment Plan
SHAPE	Supreme Headquarters, Allied Powers Europe
SLBM	Submarine-launched ballistic missile
SLCM	Sea-launched cruise missile
SNA	Soviet Naval Aviation
SNDV	Strategic nuclear delivery vehicle
SRAM	Short-range attack missile
SRBM	Short-range ballistic missile
SSBN	Nuclear ballistic-missile submarine
SSN	Nuclear attack submarine
SUAWACS	Soviet airborne warning and control system
TEL	Transporter/erector/launcher
TERCOM	Terrain contour mapping
TNF	Theater nuclear force
TSP	Tactical Strike Program
UE	Unit equipment
UK	United Kingdom
USAFE	United States Air Force, Europe
VLF	Very low frequency
VN	Vulnerability number
WDSP	Weapon-delivery sortie potential

[redacted]